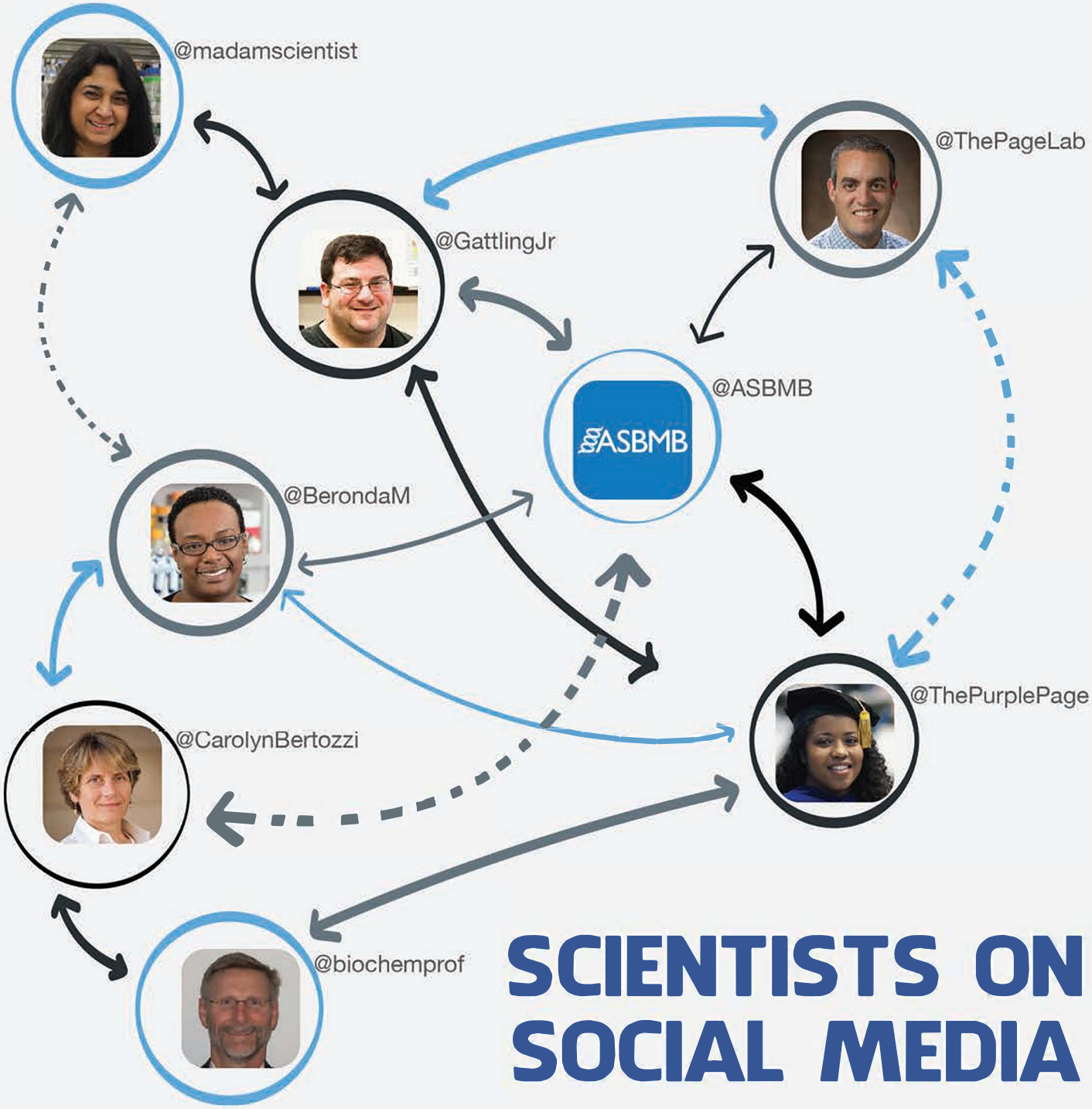
Vol. 15 / No. 8 / September 2016

ASBMB TODAY

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



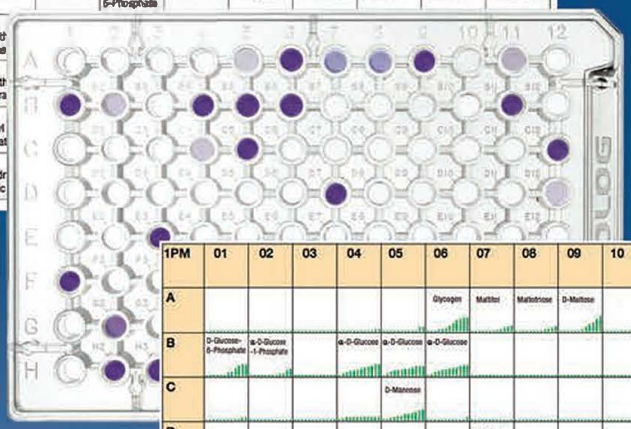
SCIENTISTS ON SOCIAL MEDIA

Cell Energetics and Metabolic Profiling using Biolog Phenotype MicroArrays™

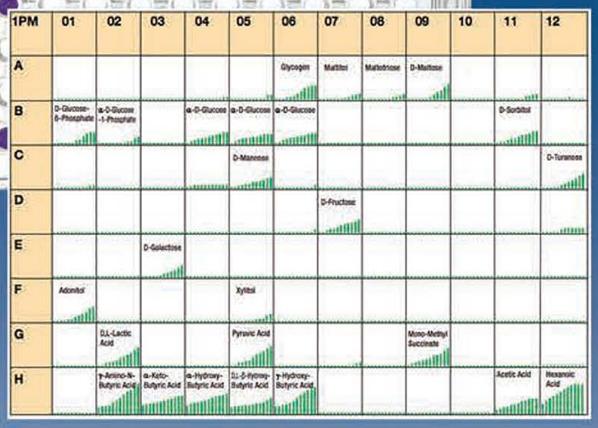
- Profile cell lines or primary cells
- Measure metabolic rates for hundreds of substrates
- Detect metabolic changes that correlate with disease states
- Simple colorimetric assays any lab can perform

A1 Negative Control	A2 Negative Control	A3 Negative Control	A4 α-Cyclodextrin	A5 Dextrin	A6 Glycogen	A7 Maltitol	A8 Maltotriose	A9 D-Maltose	A10 D-Trehalose	A11 D-Cellobiose	A12 β-Gentiobiose
B1 D-Glucose-6-Phosphate	B2 α-D-Glucose -1-Phosphate	B3 L-Glucose	B4 α-D-Glucose	B5 α-D-Glucose	B6 α-D-Glucose	B7 3-O-Methyl-D-Glucose	B8 α-Methyl-D-Glucoside	B9 β-Methyl-D-Glucoside	B10 D-Salicin	B11 D-Sorbitol	B12 N-Acetyl-D-Glucosamine
C1 D-Glucosaminic Acid	C2 D-Glucuronic Acid	C3 Chondroitin-6-Sulfate	C4 Mannan	C5 D-Mannose	C6 α-Methyl-D-Mannoside	C7 D-Mannitol	C8 N-Acetyl-β-D-Mannosamine	C9 D-Melezitose	C10 Sucrose	C11 Palatinose	C12 D-Turanose
D1 D-Tagatose	D2 L-Sorbose	D3 L-Rhamnose	D4 L-Fucose	D5 D-Fucose	D6 D-Fructose-6-Phosphate	D7 D-Fructose	D8 Stachyose	D9 D-Raffinose	D10 D-Lactitol	D11 Lactulose	D12 α-D-Lactose
E1 Melibionic Acid	E2 D-Melibiose	E3 D-Galactose	E4 α-Methyl Galactose								
F1 Adonitol	F2 L-Arabinose	F3 D-Arabinose	F4 β-Methyl Xylopyranoside								
G1 Tricarballylic Acid	G2 D,L-Lactic Acid	G3 Methyl D-lactate	G4 Methyl pyruvate								
H1 Acetoacetic Acid (a)	H2 γ-Amino-N-Butyric Acid	H3 α-Keto-Butyric Acid	H4 α-Hydroxy Butyric								

96 well plates prefilled with energy substrates



Add cells, Biolog redox dye and incubate for 3 hours



Capture metabolic rates with the OmniLog®

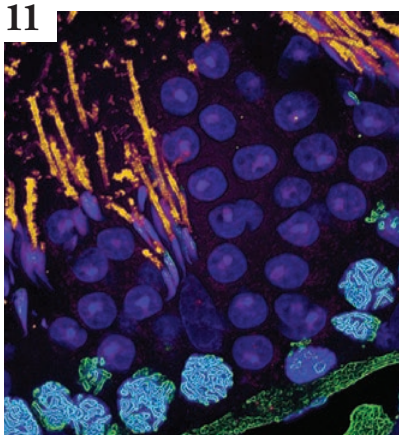
Learn more about Phenotype MicroArrays at http://info.biolog.com/ASBMB.html

BIOLOG

CONTENTS

NEWS

11



FEATURES

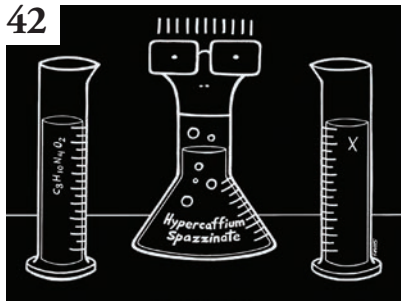
18

Scientists and science communicators describe the highs and lows of engaging on social media.

30

PERSPECTIVES

42



40

TRANSITION STATES

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

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

Being social

I have admired Carolyn Bertozzi's work for more than a decade. When I used to work at a now-defunct magazine that reported advances in analytical chemistry, Bertozzi's work developing mass spectrometric methods to analyze complex sugars at the University of California, Berkeley, caught my attention. (Bertozzi is now at Stanford University.) Her papers were easy to understand and follow, even for someone like me who is not an expert in mass spectrometry or glycobiology. And as I read more papers, the elegance and depth of the described experiments increased my admiration for her and her group.

During this time, social media became a thing. By 2012, a journalist had to have a social media presence to be relevant. So I decided to join Twitter. (I already was using Facebook for my personal life and doing my part for the universe's collection of cat photos.)

Twitter allowed for something that Facebook didn't: It was possible to read perspectives different from my own and from those of my friends. Twitter also let me follow people and organizations that I was interested in, helping me to forge connections that would otherwise be hard to make.

So imagine my thrill to discover Bertozzi on Twitter a few years ago when someone retweeted Bertozzi's lament that she couldn't get on a plane from the U.S. to Canada because she had left her passport at home.

I was overjoyed and shocked. Overjoyed because I now could follow a scientist I admired on Twitter. Shocked because Bertozzi was admitting to making such a mundane mistake. With her high-profile accomplishments, I held her in my mind as someone who had a secret magic touch in science that made her different from the likes of me. But her tweet and subsequent ones proved me wrong.

In my profile of her in this issue of ASBMB Today, Bertozzi, who is one of our members, tells us why she thinks it's important that she use Twitter to let people get to know her a bit better.

The profile is part of a special section in this issue on using social media for science. Just as it did to journalism, social media is changing science. It's been said before, but it bears repeating: If you want to keep your pulse on a broad swath of science, social media is a good way to go. That's exactly what both David Bachinsky and Rick Page talk about in our section on social media.

Bethany Brookshire, also known as Scicurious, discusses how to hover over that blurry line between personal and professional on social media.

ASBMB Today's executive editor, Angela Hopp, gives tips on how to promote your work on social media.

Allison Frick, the American Society for Biochemistry and Molecular Biology's digital media specialist, offers a handy guide on how to engage in best practices on Facebook, Twitter and LinkedIn.

And finally, acknowledging that with the great power of social media comes great responsibility, we have a piece by Marney White, who got ripped to shreds on Facebook.

You'll note in the masthead that I now am the magazine's managing editor. I look forward to hearing from you. You can email me at asbmbtoday@asbmb.org. Better yet, find the ASBMB community on Facebook or Twitter (@ASBMB) and join us in talking about science and the awesome people who do it.

Rajendrani Mukhopadhyay

Recess is over and there's still lots to do

By Benjamin Corb

Members of Congress return from their August recess the week of Sept. 6 and will be in Washington, D.C., for four weeks before heading back to their home districts for the election season. The most important thing Congress must do during those four weeks is fund the federal government beyond the current fiscal year, which ends Sept. 30. Under normal circumstances, Congress would have passed appropriations bills setting funding for the next fiscal year by now. But these are not normal circumstances. Not setting funding levels for fiscal year 2017 has consequences to our research community, especially for those investigators funded by the National Institutes of Health.

In early June, the Senate Appropriations Committee approved a funding proposal that would increase NIH funding for FY17 to $37 billion, a $2 billion increase over the previous year. In July, the House of Representatives approved its own funding proposal, which increased NIH funding by $1 billion for FY17. While we obviously would prefer a $2 billion increase over a $1 billion increase, it is clear that bipartisan, bicameral support exists to increase needed investments in research at the NIH. Unfortunately, time is running out for these proposals to navigate the legislative process, making the likelihood of a continuing resolution a near-certain outcome.

A continuing resolution, which funds the federal government at the previous year's approved funding level, ensures that, at a minimum, the government has funds in place to continue with the status quo and avoids a government shutdown. However, continuing resolutions are generally bad for the scientific community. First, continuing resolutions, which can last anywhere from two weeks to a full year, freeze funding levels at agencies and leave them unable to plan properly for their next year. The NIH routinely has held down paylines while under a continuing resolution to ensure that it has the necessary funding to complete the fiscal year. The agency does this because it doesn't know when or if the next year's funds will be approved or exactly how much money the agency ultimately will have to invest. Congressional inaction literally can withhold from the research community millions, if not billions, of dollars. Every day that Congress delays passage of the FY17 spending bills, researchers don't receive the funding needed to help improve the quality of life and well-being of Americans.

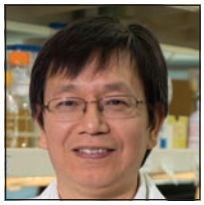
The scuttlebutt on Capitol Hill is that Congress will pass a short-term continuing resolution to fund the government through the November election. A short-term continuing resolution is common during an election year when the congressional calendars are limited due to campaign season. But the community of research advocates must continue to pressure Congress to take the necessary action to make increases in science funding not just bipartisan proposals but also bipartisan accomplishments.

Benjamin Corb (bcorb@asbmb.org) is the director of public affairs at the American Society for Biochemistry and Molecular Biology.

Interested in science policy?

Follow our blog for news, analysis and commentary on policy issues affecting scientists, research funding and society.
Visit policy.asbmb.org.

Protein Society award winners



XU

CRAIK

GARCIA

The Protein Society, a scholarly organization dedicated to promoting the study of protein structure, function and design, honored three American Society for Biochemistry and Molecular Biology members with awards this past July at its 30th annual symposium.

H. Eric Xu, distinguished director at the VARI–SIMM Research Center, was the recipient of the Hans Neurath Award, which is sponsored by the Hans Neurath Foundation. The award recognizes novel contributions to basic protein research and honors the legacy of Hans Neurath, a prominent protein chemist. Xu had two research papers on plant hormones honored as top-10 breakthroughs by the journal Science in 2009 and by the Chinese Academy of Sciences in 2014. A recent paper from Xu's group on the first X-ray laser structure of a complex between a G-protein–coupled receptor and an arrestin complex also was recognized by Chinese Academy of Sciences this year as a top-10 breakthrough.

Charles Craik, a pharmaceutical chemist who is also the director of the chemistry and chemical biology graduate program at the University of California, San Francisco, received the Emil Thomas Kaiser Award. The award is given to a scientist who recently has made a signification contribution to the study of proteins in applying chemistry. Craik and his students explore the chemical biology of proteolytic enzymes, their receptors and their natural inhibitors. His research efforts toward understanding these proteins have aided in the rapid detection and treatment of infectious disease and cancer. Craik is also the founder of Catalyst Biosciences, a biotechnology company focused on protease therapeutic agents.

Benjamin Garcia, presidential associate professor at the University of Pennsylvania's Perelman School of Medicine, was honored with the Young Investigator Award. This award recognizes a young scientist in the first eight years of his or her independent career who has made significant contribution to protein research. Garcia's research interests lie in the development and application of quantitative mass spectrometry-based proteomics as a means for understanding the dynamic proteome and protein post-translational modifications.

Charpentier and Doudna win Tang Prize

CHARPENTIER

DOUDNA

Two ASBMB members, Emmanuelle Charpentier and Jennifer Doudna, along with Feng Zhang, are being honored with the Tang Prize in Biopharmaceutical Sciences. Established in 2012 by Taiwanese entrepreneur and philanthropist Samuel Yin, the Tang Prize honors the outstanding achievements of individuals in four areas: sustainable development, biopharmaceutical science, sinology and the rule of law.

Charpentier and Doudna have been recognized for developing a novel genome editing technology known as CRISPR/Cas9. This tool is revolutionizing the life sciences by allowing researchers efficiently and accurately to modify DNA. Their new technology has the potential to address a host of problems, such as repairing defective genes and treating various genetic illnesses.

Charpentier is the director of the Max Planck Institute for Infection Biology and was awarded an Alexander von Humboldt professorship in 2014. She is one of the co-founders of CRISPR Therapeutics, a biotechnology company that uses this new technology to treat genetic diseases.

Doudna is a professor of molecular and cell biology and of chemistry at the University of California, Berkley, where she holds the Li Ka Shing chancellor's chair in biomedical and health sciences. She is also an investigator at the Howard Hughes Medical Institute.

Joan Steitz recognized for teaching

STEITZ

Joan Steitz, the Sterling professor of molecular biophysics and biochemistry at Yale University, has been recognized for her outstanding contributions to teaching with the William Clyde DeVane Medal.

The DeVane Medal honors Yale faculty members for their undergraduate teaching as well as their scholarly achievements. Established in 1966 by Yale's Chapter of Phi Beta Kappa, this award is named in honor of William Clyde Devan, the former dean of Yale College from 1938 to 1963. Steitz was nominated by Yale's undergraduate Phi Beta Kappa members for her leadership and excellence as an educator.

Renowned in the field of RNA research, Steitz leads a lab at Yale that focuses on the understanding of RNA

biology. She is a Howard Hughes Medical Institute investigator and a recipient of the National Medal of Science. In 2015, the ASBMB recognized her work with RNA with the 2015 Herbert Tabor Research Award.

Wattenberg joins Virginia Commonwealth University

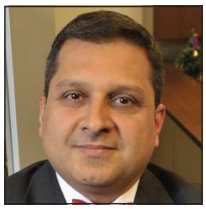
WATTENBERG

Brian "Binks" Wattenberg joined the department of biochemistry and molecular biology at Virginia Commonwealth University in August. Wattenberg previously was an associate professor in the department of medicine at University of Louisville.

Wattenberg's group studies the regulation of sphingolipid metabolism by the ORMDL family of endoplasmic reticulum proteins. Wattenberg received a Ph.D in biochemistry from Washington University in St. Louis and completed his postdoctoral fellowship at Stanford University.

By Erik Chaulk

Shilatifard receives award for research excellence



SHILATIFARD

Ali Shilatifard, a biochemist and molecular biologist, has received the Martin E. and Gertrude G. Walder Award for Research Excellence. This award was established to recognize outstanding researchers at Northwestern University, where Shilatifard serves as chairman of the biochemistry and molecular genetics department at the Northwestern University Feinberg School of Medicine.

Shilatifard's research is based on understanding how epigenetics and transcription malfunction is associated with the pathogenesis of human cancer. More specifically, he and his group want to understand how certain mechanisms can activate or suppress specific patterns of gene expression. Shilatifard also is interested in how inherited or environmental factors can contribute to the development of cancer. To date, Shilatifard's epigenetic inhibitors are being tested for various forms of cancer, such as brain cancer and childhood leukemia.

By Erik Maradiaga

Freeze is FASEB's new president

FREEZE

On July 1, the Federation of American Societies for Experimental Biology welcomed its new president, Hudson H. Freeze. Freeze is the director of the human genetics program at the Sanford–Burnham–Prebys Medical Discovery Institute in La Jolla, California.

Among his priorities during his year as FASEB president is increasing communication with FASEB member societies. The ASBMB is one of the member societies. "One thing is fundamental: FASEB represents scientists. From postdocs to society leaders, I want us to have an open dialogue — scientist to scientist — about how FASEB can better serve its members and the scientific community," Freeze said in a FASEB press release.

Freeze is a past president of the Society for Glycobiology and its first representative to the FASEB board of directors. He is an ASBMB member and serves on the ASBMB's Public Outreach Committee.

By Rajendrani Mukhopadhyay

NIH UPDATE: Long spearheads division at NIGMS

LONG

Rochelle M. Long has been appointed director of the National Institute of General Medical Sciences division of pharmacology, physiology and biological chemistry, known as PPBC. NIGMS Director Jon R. Lorsch made the appointment, citing Long's reputation for excellence in promoting collaboration among scientists across institutional and international borders. Long completed her Ph.D. in pharmacology at the Uniformed Services University of the Health Sciences in Bethesda, Md, and previously served as a faculty member at the University of Maryland, Baltimore's School of Pharmacy. During her time at the PPBC, Long was instrumental in establishing the National Institutes of Health's Pharmacogenomics Research Network. Long said she believes that cross-disciplinary collaboration is the future of medical research and sees tremendous opportunity for such efforts within the PPBC, a large division that spans a broad range of basic and clinical studies from synthetic chemistry to traumatic injury and wound healing. As director, Long said she intends to strengthen emerging and established fields of research by continuing to promote collaboration within and outside the institute.

By Melissa Bowman

E. C. Slater (1917 – 2016)

By Piet Borst

With the death of Edward Charles Slater, "Bill" for friends, biochemistry loses one of the giants of the field of bioenergetics. An excellent biochemist, Slater was also an outstanding mentor and a gifted administrator who turned Biochimica et Biophysica Acta into one of the most influential biochemical journals of the 1960s and '70s and who contributed to the governance of numerous organizations, including the International Union of Biochemistry and Molecular Biology (1).

Slater was born on Jan. 16, 1917, in Melbourne, Australia, where he studied chemistry at Ormond College at the University of Melbourne. Before 1940, it was not possible to get a doctorate in Australia. In 1946, Slater and his wife, Marion, a biologist he had met while working at the Australian Institute of Anatomy during World War II, moved to Cambridge, England.

At Cambridge, Slater started his Ph.D. research with David Keilin, a parasitologist who was famous for discovering the cytochromes of the mitochondrial respiratory chain. Using the Keilin-Hartree heart-muscle preparation, now known to contain fragments of the mitochondrial inner membrane, Slater discovered that the respiratory chain was inhibited by the dithiol di-mercaptopropanol, or BAL, at a new component of the chain (2). Initially called the BAL-labile factor, this component was later dubbed the Slater factor.

After a one-year postdoctoral fellowship in the lab of the future Nobelist Severo Ochoa at New York University, Slater returned to Cambridge for an independent position in David Keilin's Molteno Institute for Research in Parasitology, where he set up collaborations with several excellent staff members. Studies with dinitrophenol, an uncoupler of oxidative phosphorylation, led Slater to formulate a theory for the coupling of oxidation to phosphorylation that became known as the chemical theory of oxidative phosphorylation (3) to distinguish it from the chemi-osmotic theory formulated in 1961 by Peter Mitchell. The competition between these two theories would dominate bioenergetics in the 1960s (4). Mitchell's theory eventually would prevail, and he would receive the Nobel Prize.

PHOTO COURTESY OF PIET BORST

Edward Charles Slater

Slater searched in vain for the chemical high-energy intermediates postulated by the chemical theory of oxidative phosphorylation. Eventually Jan Rosing, Jan Berden and Slater found tightly bound ATP and ADP in the highly purified F1-ATPase-complex. Slater then realized that the high-energy intermediate might be a high-energy state of this complex. A complete form of this conformational hypothesis for ATP synthesis was formulated by Paul Boyer, who received the Nobel Prize for his work.

In 1955, Slater accepted the biochemistry chair of the medical faculty at the University of Amsterdam. The laboratory was housed in a former leper hospital, and the science was in poor shape, but Slater soon assembled a cast of foreign postdoctoral fellows and foreign colleagues coming for sabbaticals, and within a year the first graduate students were recruited. Eventually, the Amsterdam biochemistry department would grow into a super department, serving four faculties — medicine, chemistry, biology and dentistry — that were housed in three different locations in the city. Slater chaired the department supported by seven (associate) professors, mostly recruited from the ranks of his pupils. As biochemistry expanded in the 1960s and '70s, Slater's pupils landed chairs in many other Dutch universities.

Eventually Slater became the most influential biochemical scientist in the Netherlands, dominating Dutch biochemistry in the second half of the 20th century. His exceptional talents as a scientist and organizer allowed him to attract the best students, postdocs and colleagues on sabbatical and to inspire and educate them. An ideal role model with high standards, a devotion to well-planned research and deep knowledge of the literature, he did a superb job organizing and running his department.

Once in Amsterdam, Slater increasingly contributed to the organization of biochemistry in the world. He was secretary of the Committee on Biochemical Nomenclature of the International Union of Pure and Applied Chemistry (1959–1964)

and contributed in many ways to the running of European Molecular Biology Organization and the European Molecular Biology Laboratory. He chaired the EMBO Fund Committee from 1974 to 1978 and was a long-standing auditor of EMBO. He was president of the EMBL Council and chairman of the organization's search committee when it selected Lennart Philipson to succeed John Kendrew to be director-general of EMBL.

Slater enjoyed the social side of science. He liked the scientific excitement and camaraderie of scientific meetings and the interaction with colleagues at committee meetings. Hence, it is not surprising that a person of Slater's scientific stature and managerial qualities would be recruited by the IUBMB for help. In 1964, he became a council member, from 1971 to 1979 he acted as treasurer, in 1985 he became president-elect and from 1988 to 1991 he served as president of the IUBMB. From 1999 to 2000, he served as treasurer for a second time.

To many biochemists, Slater was known as Mr. BBA (5). Under his leadership, BBA grew to become the largest scientific journal in the world and long remained one of the best. Slater continued running BBA until 1982, often together with former pupils and close international colleagues. He remained honorary executive editor and worked for BBA until he was well into his 80s.

Slater's retirement from the university in 1985 did not end his involvement with science and teaching. He moved to Lymington in the south of Britain and became an honorary professor at the University of Southampton, where he contributed to the teaching of biochemistry and administrative tasks. The university thanked him for his efforts with an honorary doctorate. He also received an honorary doctorate from the University of Bari in Italy in recognition of his contributions to the highly successful Bari-Amsterdam Symposia on Bioenergetics, the first truly European biochemical symposia.

Slater received many other honors during his professional life, such as honorary membership in the British Biochemical Society and four other biochemical societies. He was a fellow of the British Royal Society, a member of the Royal Netherlands Academy of Arts and Sciences, and a foreign member of the academies of science of Argentina, Australia, Belgium and Sweden. In the Netherlands, he received the Royal Dutch Shell Prize, and the Dutch queen made him Knight of the Order of the Dutch Lion, one of the highest distinctions bestowed on scientists in the Netherlands.

Slater was in excellent health until well into his 90s. He skied at his second home in Switzerland until 80, sailed single-handedly on the North Sea until 90, continued writing lucid and interesting overviews of the history of the development of biochemistry, and kept up a lively correspondence with colleagues and former pupils. His last years were difficult: He lost his only daughter to cancer, and his wife became deaf and blind. He leaves behind his wife (100 years old), three grandchildren and his son-in-law. He will be remembered by a wide circle of former colleagues and pupils as a warm friend and unforgettable mentor.

REFERENCES

1 Slater, E.C., *Compreh. Biochem.* **40**, 69 – 203 (1997).

2 Slater, E.C., *Nature* **161**, 405 (1948).

3 Slater, E.C., *Nature* **172**, 975 – 978 (1953).

4 Slater, E.C., *Eur. J. Biochem.* **1**, 317 – 326 (1967).

5 Slater, E. C., *Biophysica Acta: The Story of a Biochemical Journal* (1986).

Piet Borst (p.borst@nki.nl) is an emeritus professor of clinical biochemistry and molecular biology at the University of Amsterdam and the former director of research of the Netherlands Cancer Institute in Amsterdam, where he is now a staff member.

The Art of Science Communication

Fall session begins Oct. 3

The Art of Science Communication online course provides participants with fundamental communications training, focusing on how to present science to a nonexpert audience in a formal setting.

Registration deadline is Sept.19

Take part in the ASBMB class from wherever you are for only **three to four hours** a week.

During the course, you will learn to:

- construct and deliver an effective presentation
- get your message across
- generate interest in your topic
- engage your audience
- effectively use nonverbal communication

The course is eight weeks long and costs $25 for ASBMB members.

www.asbmb.org/outreach/training

ASBMB
American Society for Biochemistry and Molecular Biology

A holistic view of ovarian cancer

By Rajendrani Mukhopadhyay

The American Cancer Society estimates that about 22,280 women this year will receive a first-time diagnosis of ovarian cancer. The cancer, which has various forms, is the most lethal disease of the female reproductive system.

In a paper published in the journal Cell on June 29, researchers presented one of the largest studies ever done of the most malignant type of ovarian cancer. The scientists carried out proteomic analyses of highly malignant tumors and then integrated their data with genetic and clinical information. The detailed view of the tumors gave the researchers a better understanding of what makes these tumors so aggressive.

In 2011, The Cancer Genome Atlas, a project undertaken by the National Cancer Institute, provided a list of genetic mutations in ovarian cancers. "The Cancer Genome Atlas did a fantastic job of cataloging the genomic aberrations associated with many different cancer types, including the most lethal form of ovarian cancer," which is high-grade serous carcinoma, or HGSC, says Karin Rodland at the Pacific Northwest National Laboratory. She co-led the study published in Cell with Daniel W. Chan at Johns Hopkins University.

The researchers, who came from nine institutions across the U.S. and were funded by the NCI, were interested in how genetic defects affected proteins, which are one of the workhorses in the cell. "We were also interested in protein phosphorylation as a marker of information flow in the cancer cell and as a way of telling which signaling pathways were most activated in HGSC," says Rodland.

Rodland adds that the researchers wanted to compare cases of HGSC that had the worst outcomes, where the women died in less than three years, with cases in which patients lived for five years or longer. The hope was that the comparison would give scientists fresh clues about the disease.

The team examined 169 tumor samples and identified 9,600 proteins from all the samples. They focused on 3,586 proteins common to all the samples and combined their analyses with genetic and clinical data. The team found that a critical malfunction in HGSC involved changes in DNA where parts either were deleted or copied more than once.

Duplications of sections in chromosomes 2, 7, 20 and 22 caused 200 proteins to be produced in greater numbers. When they looked more closely at those 200 proteins, the researchers found "the affected proteins were highly enriched for functions related to cell motility, invasion and immunity," says Rodland. These functions help make a cancer more aggressive.

Proteins undergo post-translational modifications, which influence their functions. By looking at the copies of proteins produced as well as their post-translational modifications, the investigators were "able to derive a signature from the pattern of affected proteins that could discriminate between patients with short and long overall survival with a highly significant probability," says Rodland. This signature was much better at predicting survival outcomes of the women with ovarian cancer than other prognostic signatures.

Moreover, Chan explains that the Hopkins group of researchers selected 122 of the 196 samples based on a deficiency in homologous recombination, a process that is supposed to repair damaged DNA. Ovarian cancer patients with the deficiency usually get treated with a particular drug.

Chan notes that the study revealed several protein post-translational modifications that were associated with the deficiency that "might help explain why not every patient with the homologous recombination deficiency responds to the same drug treatment," he says. "This finding could help select patients for the right therapy."

The researchers now are working to validate their observations using a completely different set of patients, but Rodland says that the current study unequivocally shows the importance of a holistic view. "You have to look at the whole flow of information, from genome to transcriptome to proteome and phosphoproteome, in order to get a complete picture of cancer biology," she says. Rodland points out that the protein phosphorylation data helped the team identify activated pathways that provided "an additional level of information about cancer biology that cannot be derived from genomic data alone."

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the managing editor for ASBMB Today. Follow her on Twitter at twitter.com/rajmukhop.

A new roundup of biofilms

By Hailey Gahlon

Biofilms are sticky. Often slimy and good at adhering to surfaces, these complex microbial communities thrive in moist environments. They can be disruptive. For example, they clog pipes, contribute to dental plaque and wreak havoc with implanted medical devices. Many pathogenic microorganisms that form biofilms pose serious medical problems, as the resulting infections are often difficult to treat.

Biofilms, which can be formed by both bacteria and fungi, create an extracellular matrix made up of proteins, DNA, lipids and sugars. The matrix facilitates molecular communication between the microorganisms within the biofilm to enable adherence to surfaces. The matrix also is involved in the development of antibiotic resistance. The **Journal of Biological Chemistry** recently published a five-part thematic minireview series that focuses on biofilms and their role in human health and disease. The series was edited by JBC associate editor Norma Allewell at the University of Maryland.

Exopolysaccharides provide functional and structural integrity to biofilms. The first minireview in the series, by Donald C. Sheppard at McGill University and P. Lynne Howell at the University of Toronto, describes their role in pathogenic fungi. Although the enzymes that form fungal biofilms of Candida albicans and Aspergillus fumigatus lack sequence homology with bacterial exopolysaccharide biosynthetic enzymes, they are functionally similar in many ways. The similarity extends to therapeutic targets; for example, a new class of anti-fungal drugs called echinocandins inhibits a beta-1-3 glucan synthase in C. albicans and shows potential anti-biofilm activity.

The second minireview, by John Gunn, Lauren Bakaletz and Daniel Wozniak at Ohio State University, discusses the extracellular matrix of three bacteria, Pseudomonas aeruginosa, Haemophilus influenza and Salmonella enterica. The authors describe the variety of approaches researchers have taken to target the extracellular matrix, including matrix-degrading enzymes, small-molecule inhibitors and immunotherapeutics. They also suggest that a clearer understanding of the role of the matrix in biofilm production could come via the development of animal models that better mimic human infection.

Martina Valentini and Alain Filloux at Imperial College London investigate the role of cyclic-di-GMP signaling in biofilms with the model organism Pseudomonas aeruginosa in the third minireview. Cyclic-di-GMP is a second messenger that is involved in the life cycle of biofilm formation, which begins with surface attachment, then colony maturation and finally dispersion. Studies of two enzymes involved in cyclic-di-GMP metabolism, mutant diguanylate cylcases and phosphodiesterases, have demonstrated their role in biofilm development. For example, five diguanylate cylcases have been shown to be involved in the transition from the motile to the surface-attached stage.

In the fourth minireview, Jeffery S. Kavanaugh and Alexander R. Horswill at the University of Iowa discuss peptide-quorum sensing in the gram-positive bacterium Staphylococcus. The quorum sensing system is termed the accessory gene regulator, or agr, system. Kavanaugh and Horswill outline the influence of various environmental factors, such as pH, reactive oxygen species and nutrients that can influence the agr system. They also suggest that future work to understand key signaling molecules of the agr system could aid in the development of better therapies to treat staphylococcal infections.

Biofilms are involved in antibiotic resistance, but their involvement is not well understood. In the fifth minireview, Heleen Van Acker and Tom Coenye at Ghent University in Belgium describe two mechanisms of antibiotic resistance. First, they focus on efflux pumps that remove intracellular antibiotics to keep the concentration of the drug below a critical threshold. The authors note that little is known about the regulation and expression of efflux pumps in biofilm growth. The second mechanism they discuss involves persister cells that can tolerate high levels of antibiotic compounds. The authors also explore one confounding area of research, the question of whether persister cells are dormant cells with inactive antibiotic targets or have different metabolic states.

Hailey Gahlon (h.gahlon@imperial.ac.uk) is a Marie Curie postdoctoral research fellow at Imperial College London.

Special subunit meets energy demands for spermatogenesis

By Amber Lucas

The balance between glycolysis and oxidative phosphorylation plays a central role in many cellular processes, such as cell function, cell fate and disease progression. Pyruvate, a product of glycolysis that acts as an electron donor for oxidative phosphorylation, links these two pathways together. In a recent paper published in the **Journal of Biological Chemistry**, Benoît Vanderperre and colleagues at the University of Geneva in Switzerland discovered a new subunit for the complex that carries pyruvate across the inner mitochondrial membrane. The subunit appears to be found only in placental mammals and is thought to play a role in meeting the energy demands of spermatogenesis.

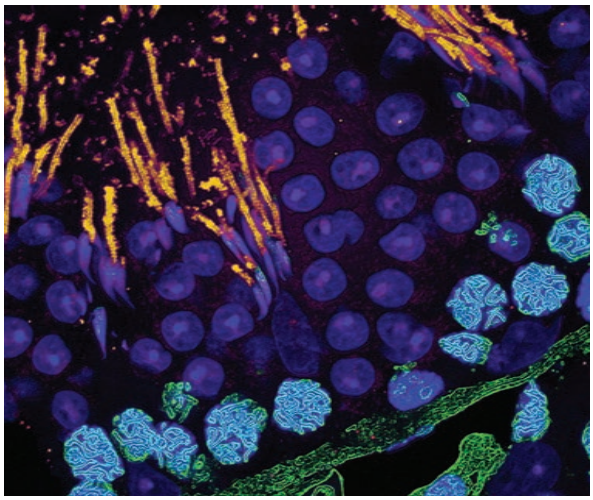


PHOTO COURTESTY OF BENOÎT VANDERPERRE

Images of mouse seminiferous tubule showing nuclei (blue), the synaptonemal complex from spermatocytes (green), and the MPC1-like subunit in mitochondria (orange/red).

Glycolysis and oxidative phosphorylation are vital for cellular energy production. Glycolysis breaks down sugar to form precursors for other metabolic pathways, a small amount of ATP and pyruvate. Oxidative phosphorylation is responsible for the majority of ATP production within the mitochondria and uses pyruvate as an electron donor. Understanding how pyruvate is transported within the cell is important for appreciating how cytosolic and mitochondrial metabolism are coordinated and how metabolic processes are important for cell fate and function.

Pyruvate is transported across the inner mitochondrial membrane by a complex called the mitochondrial pyruvate carrier. MPC is made up of two subunits, MPC1 and MPC2. Studies with yeast have uncovered a third MPC subunit involved in the switch between fermentation and respiration, but characterization of the MPC in higher eukaryotes remains incomplete. This led to the search for other components that may make up the MPC in higher eukaryotes.

Vanderperre and colleagues discovered the new subunit, called MPC1-like, or MPC1L for short, while searching for proteins similar to the MPC1 and MPC2 nucleotide sequences. The investigators found there is a high degree of sequence conservation between MPC1 and MPC1L, with slight variations in the length of the C-terminus.

Genes with high-sequence similarity do not always behave analogously at the protein level, so the team set out to determine the correspondence between MPC1 and MPC1L. They began by looking at subcellular localization of MPC1L using immunofluorescence. The immunofluorescence data showed that MPC1L is a membrane protein inserted in the inner mitochondrial membrane with a topology and structure that parallels that of MPC1. Using bioluminescence resonance energy transfer and respirometry experiments that monitored pyruvate flux, the investigators also were able to show that MPC1L not only can interact physically with MPC2, the other subunit in the MPC complex, but also forms a functional complex. This functional complex is able to facilitate pyruvate import into the mitochondria at rates comparable to the MPC1/MPC2 complex.

So if MPC1 and MPC1L have similar functions at similar efficacies, why does the cell expend energy to make both of them? It turns out that, while their functions are similar, their expression patterns are not. MPC1 is expressed ubiquitously, while MPC1L is highly expressed in the testes and may also be expressed in fetal heart and ovaries.

This raises questions about the role of MPC1L in spermatogenesis and how it may be linked to cell fate determination and function in this specific cell type. Metabolic processes have been shown to play important roles in differentiation, so Vanderperre and colleagues speculate that the extra expression of MPC1L could help meet higher demands for MPC function during spermatogenesis in placental mammals.

Amber Lucas (aluca685@gmail.com)is a graduate student at Carnegie Mellon University.

Isomerases determine green odor of plants

By Lee D. Gibbs

When a plant's tissue gets damaged, it gives off a green, leafy odor. In an effort to make crops like tomatoes more appealing to consumers, breeders of fruits and vegetables are interested in masking or sweetening this odor, which can affect a food's flavor. Conventional breeding methods have been tried, but with limited results. Some researchers think genetic identification methods may hold the key to odor and flavor enhancement.

Researchers have identified hexenal isomerases that give plants their characteristic smell.

The leafy odor of plants is characterized by green leaf volatiles. GLVs are composed of six-carbon compounds that provide not only the characteristic green leaf odor but also characteristic aromas and flavors to fruits and vegetables.

One compound, (E)-2-hexenal, was identified early on in GLV research and named the leaf aldehyde. But the enzyme or enzymes involved in (E)-2-hexenal production had yet to be identified.

In a recent article in the **Journal of Biological Chemistry**, Yasuo Yamauchi and his team at the Graduate School of Agricultural Science at Kobe University in Japan discuss how they identified (Z)-3:(E)-2-hexenal isomerases, or HIs, as essential to the production of the (E)-2-hexenal in plants. The team found that various plant species have homologous HIs and that red paprika, a bell pepper variant, has especially robust HI activity. They extracted and purified HI from red paprika to determine its enzymatic role in the production of the (E)-2-hexenal and to evaluate its ability to enhance the odor of tomato plants.

The researchers performed alignment and phylogenetic tree analysis and found that HIs belong to a family of a functionally diverse proteins containing a conserved barrel domain. They discovered that the three catalytic amino acids histidine, lysine and tyrosine are conserved in various plant species and form a catalytic site known as catalytic HKY in HIs. HIs enzymatically isomerize a six-carbon compound called (Z)-3-hexenal to (E)-2-hexenal; 3-hexyn-1-al, another six-carbon compound, acts as a suicide substrate for HIs by binding irreversibly to histidine. This suggests that the catalytic mode of HI is a keto-enol tautomerism reaction, which is a chemical equilibrium between a ketone or aldehyde and an alcohol mediated by a catalytic histidine residue.

The researchers compared transgenic tomato plants overexpressing the red paprika HI with wild-type tomato plants. (Z)-3-hexenal is the main volatile that determines wild-type tomato flavor and is responsible for the green, leafy odor of tomatoes. They showed that transgenic tomato plants accumulate the (E)-2-hexenal, in contrast to wild-type tomato plants that mainly accumulate (Z)-3-hexenal. This study demonstrates that the conversion of (E)-2-hexenal to (Z)-3-hexenal by HI contributes to a sweeter green odor of tomatoes. This genetic identification of volatile emissions of tomato fruits made by Yamauchi's team may provide tomato breeders with an opportunity to abandon conventional breeding methods and turn to genetic manipulation for improvement of tomato flavor.

Lee D. Gibbs (Lee.Gibbs@live.unthsc.edu) is a doctoral candidate at the University of North Texas Health Science Center.

Sphingolipids and retinal degeneration

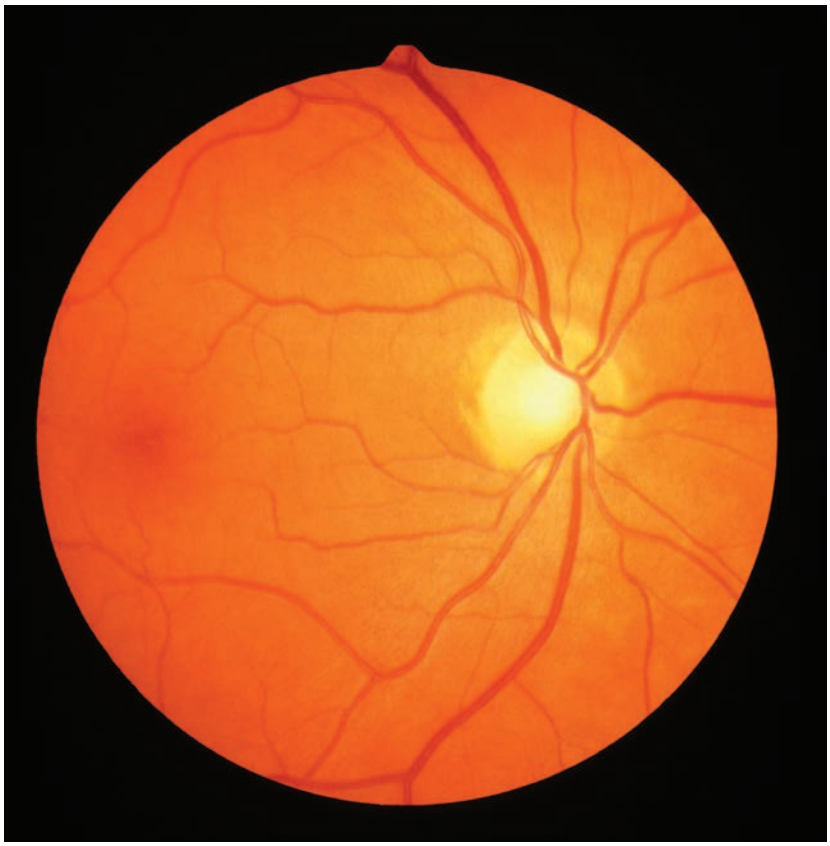
By Dawn Hayward

Two uses for the same drug. It's been done before with success. Take aspirin, which alleviates pain and is a blood thinner. Or Wellbutrin, which helps smokers quit and is an antidepressant. In a recently published paper in the **Journal of Lipid Research**, researchers took a multiple sclerosis drug called Gilenya from Novartis and gave it a new use: treatment of retinal degeneration.

Why Gilenya? Gilenya, which also goes by the name FTY720, initially was used in multiple sclerosis, a central nervous system disorder involving the destruction of certain nerve cells. Gilenya is an altered version of a natural product and has immunosuppressive effects, particularly through the blockade of sphingolipid synthesis. This last point is key, as retinal degeneration also is known to involve sphingolipid biosynthesis.

Retinal degeneration is a catchall term for a group of diseases whose hallmark is photoreceptor cell death. This cell death has many contributing factors, one of which is ceramide, a sphingolipid whose role in retinal degeneration has been investigated by the group of Nawajes Mandal at the University of Oklahoma Health Sciences Center. In fact, in previously published work, the Mandal group identified ceramide as a critical player in retinal degeneration by using Gilenya in a rat model of light-induced retinal degeneration.

In the current JLR study, Mandal and colleagues turned their focus to a laboratory rat model, one which more frequently is used in the retinal degeneration field. This rat model closely matches how retinal degeneration happens in humans. Using this popular model gives a better idea of the effects of the drug. These transgenic animals start losing their sight at post-natal day 22 and have 50 percent photoreceptor death at postnatal day 45. This occurs because they have a mutated rhodopsin gene.

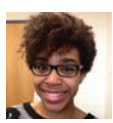


Gilenya, a multiple sclerosis drug, may have a new use as a treatment for retinal degeneration.

The investigators administered Gilenya to these rats at both the early and late stages of the disease and examined eye health, gene expression and sphingolipid levels. With early dosing of Gilenya came improved rod and cone function as well as lowered ceramide biosynthesis gene expression, two positive signs of improvement. In addition, the investigators noticed that the sphingolipid profile, a feature that was altered in the disease model, was reset, and they observed normal levels of associated enzymes were observed with Gilenya administration.

While Gilenya may appear to be a winner for retinal degeneration treatment, many questions remain. First, the exact pathway between ceramide biosynthesis and photoreceptor cell death needs to be established. Second, the precise mechanism of action of Gilenya also needs to be established. And, of course, many more studies with this drug in animal models have to be completed.

Still, this study makes a significant contribution to the search for retinal-degeneration drugs. Treatments for this disease are few and far between, and beginning with a Food and Drug Administration-approved drug is a good start to alleviating this disorder.



Dawn Hayward (dhaywar5@jhmi.edu) is a graduate student at the Johns Hopkins University School of Medicine.

Sustaining seabass

By Alexandra Nail

A major challenge of the aquaculture industry is meeting the worldwide demand for fish. With the rising demand, the the cost of the fishmeal is increasing. A widely used solution to cut costs is to replace some of the protein-rich components of fishmeal with plant-based carbohydrates. In a recent paper in the **Journal of Lipid Research**, Ivan Viegas and colleagues from the Universities of Coimbra and Barcelona investigated whether a high-carbohydrate diet increases fat deposits in seabass.

PHOTO COURTESY OF IVAN VIEGAS

Farm-raised seabass can have high fat deposits that may compromise their flavor.

Seabass, which are carnivorous, can tolerate up to 30 percent of their diet being replaced with digestible carbohydrates without compromising their growth rate. However, the replacement causes farm-raised seabass to have more fat deposits than their wild counterparts. The fat lowers the quality and taste of meat, therefore lowering the overall value of the final product.

Various methods have been used to study lipid accumulation in different fish species fed partial carbohydrate diets, but a consistent explanation for increased adiposity has not emerged. While it is clear that farmed fish have higher fat content, scientists don't know if the higher fat content is due to increased lipid synthesis or decreased lipid breakdown.

Farm-raised seabass have increased plasma, liver and whole-body lipid levels as a result of high-carbohydrate diets. In mammals, high-carbohydrate intake increases the activity of a pathway in liver and adipose tissue called de novo lipogenesis, which is primarily responsible for converting carbohydrates into fat. To determine if the same process occurred in seabass, Viegas and colleagues fed the fish a diet with either high-protein or a combined protein-and-starch content. To tease apart the lipid profiles, fish were placed into tanks containing deuterated water. The hydrogen isotope was incorporated into triacylglycerol, the main component of fat.

After six days, the investigators isolated liver and serum samples from the fish and measured the lipid profiles using nuclear magnetic resonance. The investigators found that even though plasma and liver triglyceride levels in the fish fed the high-carbohydrate diet were higher, the lipid profiles revealed no significant changes in de novo lipogenesis between fish fed the two different diets.

The investigators also measured enzymes important for NADPH production, as NADPH provides energy for de novo lipogenesis. Viegas and colleagues discovered that NADPH production was moderately increased in the fish on the high-carbohydrate diet, but it was not sufficient to increase de novo lipogenesis.

In the future, additional processes, such as tissue lipid retention or decreased fat breakdown, need to be evaluated to identify the mechanism of lipid accumulation in fish fed high-carbohydrate diets. Furthermore, implementing breeding selection strategies for lean farmed fish may be an effective solution to satisfy the ever-growing demand for high-quality seabass.

Alexandra Nail (alexandra.gjevre@uky.edu) is a doctoral candidate at the University of Kentucky.

Knockout mouse reveals links between bile acids and metabolic disorders

By Jennifer Shing

Bile acids help us absorb dietary fats and fat-soluble nutrients. The enzyme cholesterol 7α-hydroxylase, or Cyp7a1, converts cholesterol into bile acids in the first step of the classic bile acid synthesis pathway. In a recent study published in the **Journal of Lipid Research**, John Chiang at Northeast Ohio Medical University and colleagues describe their characterization of a new Cyp7a1 knockout mouse. Although previous research focused on a Cyp7a1 knockout mouse with a mixed genetic background, the genetically engineered mouse in this report had a pure genetic background. The researchers found that their new knockout mouse, when compared with the original knockout mouse, survived better, had higher glucose tolerance and was less likely to develop metabolic disorders.

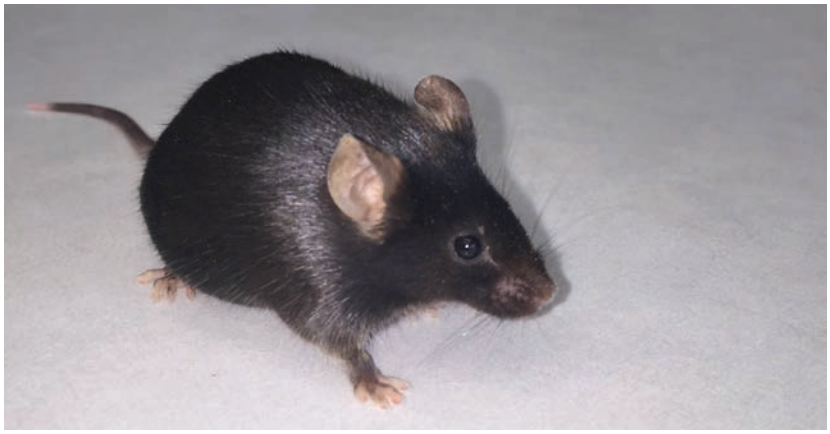


PHOTO COURTESY OF JOHN CHIANG

Pure-background knockout mice help researchers better understand bile acid composition.

Chiang and colleagues were interested in understanding the influence of bile acid synthesis on liver metabolism and disease. Mice from mixed genetic backgrounds are more variable, because they come from parents of different genetic strains. These mice with mixed origin cannot be used for nutritional studies, because the results could be influenced by genes or diet. This is why the researchers created a Cyp7a1 knockout mouse that had a single genetic background for dietary studies.

With their new knockout mouse, Chiang and colleagues performed metabolic and dietary studies. They studied multiple physiological characteristics, including bile acid pool and composition, glucose tolerance, and energy metabolism under a normal or Western diet, high in fat and cholesterol. All results were compared with results using wild-type mice expressing normal levels of Cyp7a1 and earlier studies using mixed-background Cyp7a1 knockout mice.

Although mixed-background knockout mice died without dietary supplementation of bile acids or vitamins, the pure-background Cyp7a1 knockout mice were smaller but appeared normal. The mice survived despite their decreased bile acid pool size, which was 40 percent less than in wild-type mice. There were more hydrophilic bile acids and less of the cholic acid in the knockout mice, indicating a shift toward alternative bile acid synthesis.

The investigators also noted that the knockout mice showed improved glucose tolerance compared with wild-type mice when fed a normal diet. Even on a Western diet, the knockout mice did better in tolerating glucose than wild-type mice. To understand whether changes were caused by altered bile acid composition, the authors fed the mice a diet supplemented with cholic acid. They found that the changes in bile acid makeup and glucose tolerance in the knockout mice mimicked the results in wild-type mice. Therefore, changes in bile acids are responsible for both pool composition and glucose sensitivity.

While an explanation for these results is unknown, the authors suspect that fecal bile acid reabsorption from the intestine helped the knockout mice accommodate the relative decline in classic bile acid synthesis. When fed a Western diet, the mice likely reasbored the bile acids and avoided metabolic disorders and diabetes. Also, specific bile acids enriched in the pure-background knockout mice may have triggered cellular signaling in the body, causing improved glucose tolerance.

This investigation reveals how bile acid pool makeup affects glucose and energy homeostasis. It also reminds researchers to consider genetic background whenever studying mouse models. In the future, this new Cyp7a1 knockout mouse could be used to examine how bile acid composition may help protect the body from metabolic disorders.

Jennifer Shing (jennifer.shing@gmail.com) received a Ph.D. in molecular pharmacology and experimental therapeutics from the Mayo Clinic.

Brady wins Tabor award for transition metal signaling

By Melissa Bowman

Donita C. Brady won the **Journal of Biological Chemistry/Herbert Tabor Young Investigator Award** in recognition of her promising work at the interface of cancer biology, signal transduction and cellular use of transition metals. Brady is a presidential assistant professor in the department of cancer biology at the University of Pennsylvania Perelman School of Medicine.

Brady and her group are working to identify and characterize novel roles of transition metals in kinase signaling pathways in healthy cells. Previous studies by Brady's group have identified a requirement for copper in the regulation of the kinase complex MEK1/2 in the MAPK pathway. Brady hopes this research ultimately will enable her lab to develop pharmacological interventions to target these metal-dependent pathways in cancer therapy.

PHOTO COURTESY OF DONITA BRADY

Donita Brady received the Tabor Award in June at the FASEB Conference on Trace Elements in Biology and Medicine in Montana from JBC Associate Editor Ruma Banerjee.

Brady grew up near Virginia Beach and majored in chemistry at Radford College, where she also played Division I softball. She received her Ph.D. in pharmacology from the University of North Carolina at Chapel Hill. As a graduate student in the laboratory of Adrienne Cox, Brady described the mechanism by which an atypical Rho GTPase co-opts polarity proteins in epithelial cells to contribute to tumorigenic phenotypes. In her postdoctoral work at Duke University in the lab of Christopher Counter, she uncovered a link between copper acquisition and a mitogenic kinase signaling pathway. Her postdoctoral research since has contributed to the development of a new cancer therapy, and Brady hopes that her current work will continue to produce novel therapies.

Melissa Bowman (mbowma14@alumni.jh.edu) is a scientist and health policy communicator in Washington, D.C.

Upcoming ASBMB events and deadlines

SEPT

Sept. 19–23: National Postdoc Appreciation Week

OCT

Oct. 3: ASBMB "The Art of Science Communication" online course begins
Oct. 6–9: ASBMB Special Symposium: Transcriptional Regulation by Chromatin and RNA Polymerase II, Snowbird, Utah
Oct. 13–15: Society for Advancement of Hispanics/Chicanos and Native Americans in Science National Conference, Long Beach Convention Center, booth #226, Long Beach, Calif.

NOV

Nov. 9–12: Annual Biomedical Research Conference for Minority Students, booth #701, Tampa, Fla.
Nov. 17: Abstract submission deadline for ASBMB 2017 Annual Meeting, Chicago

DEC

Dec. 1: Travel award deadline for the ASBMB 2017 Annual Meeting, Chicago
Dec. 3–7: American Society for Cell Biology annual meeting, booth #835, San Francisco

American Society for Biochemistry and Molecular Biology

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

The ASBMB accredits departments and programs offering baccalaureate degrees in biochemistry, molecular biology and other related degrees. Accredited programs gain access to an independently developed and scored examination that leads to the conferral of an ASBMB-certified degree.

There are now more than 50 ASBMB-accredited programs across the US. Recently accredited programs include:

- Presbyterian College
- University of Virginia
- Hunter College of the City University of New York
- Boston University
- Texas A&M University
- University of Arizona
- University of New Mexico
- University of Montana

ASBMB ACCREDITED

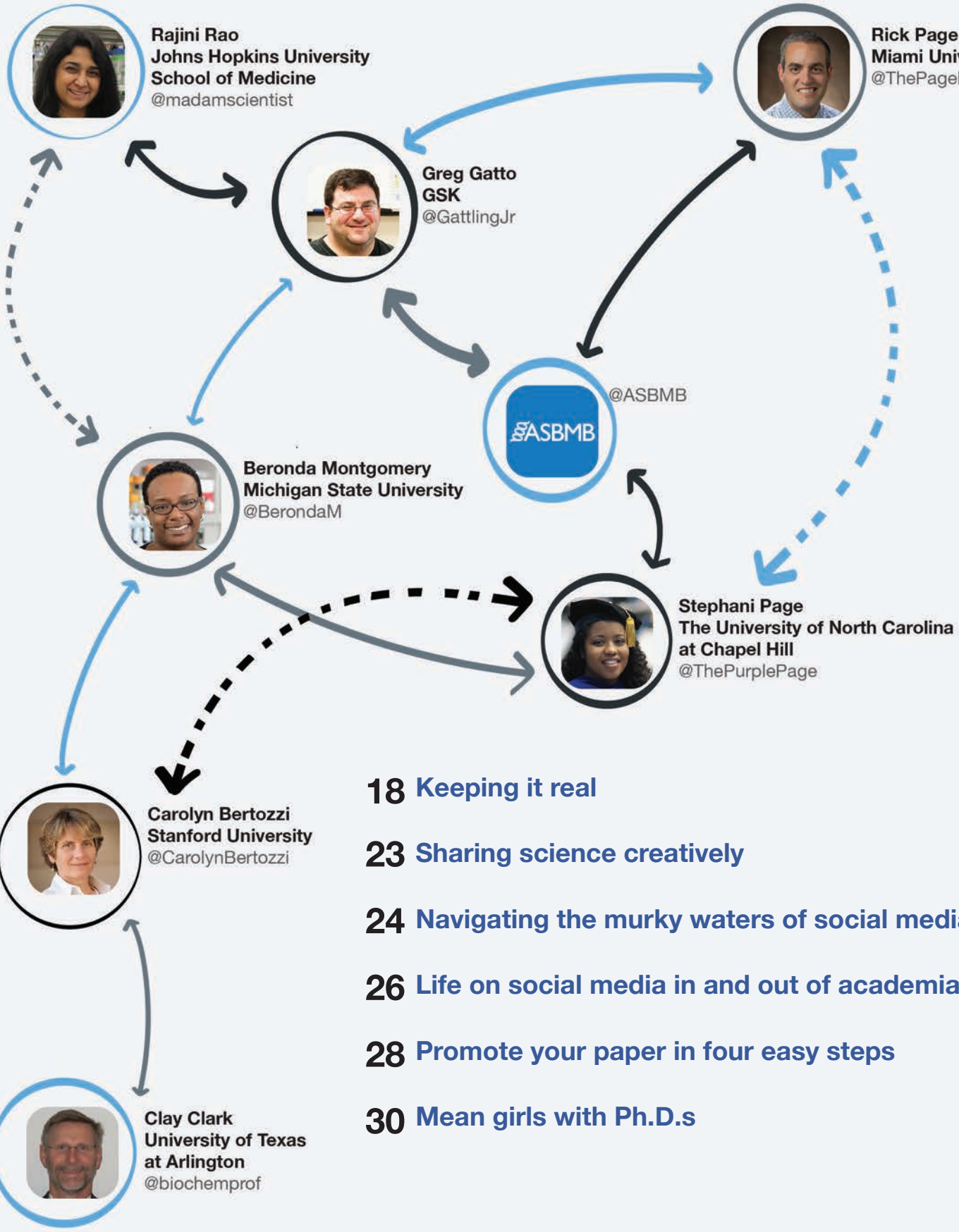
Updated application guide now available.

Next application deadline: Oct. 15

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

ASBMB
American Society for Biochemistry and Molecular Biology

SCIENTISTS ON SOCIAL MEDIA



Keeping it real

Carolyn Bertozzi isn't afraid to discuss 'the petty humiliations of life' on social media

By Rajendrani Mukhopadhyay

It is easy to be in awe of Carolyn Bertozzi. In 1999, she became a MacArthur fellow for her research in glycobiology. She was just 33. She has been an investigator with the Howard Hughes Medical Institute since 2000. She won election to the National Academy of Sciences as well as the National Academy of Medicine (formerly the Institute of Medicine). And that's not all of her scientific awards and honors.

Bertozzi, an endowed professor at Stanford University, leads a team of more than 30 people whose mission is to use tools of chemistry to study biology and develop new molecules for improving human health. Projects in the lab include the development of mass spectrometric methods to study glycosylated proteins in cells, with particular applications in cancer and stem-cell research, and understanding some of the key enzymes in the bacterium that causes tuberculosis and using the information to create a point-of-care diagnostic device for the disease. Michael Marletta at the University of California, Berkeley, notes that Bertozzi is "just the best" at using a variety of disciplines to "understand complicated biology."

With all the success that Bertozzi has earned, you might think that she has a golden touch. This is where her Twitter feed comes in.

"It's good for me to air all the petty humiliations of life" on Twitter, says Bertozzi, which she regularly uses to share science news and aspects of her life to her more than 2,000 followers.

Two years ago, on discovering she couldn't fly from the U.S. to Canada because she had forgotten her passport at home, Bertozzi delighted her Twitter followers by listing her top 10 travel blunders. (One was forgetting her bag on an airport shuttle, which resulted in a bomb squad being called in.) It prompted one of her followers to quip, "MacArthur geniuses: They're just like us!"

That's precisely the point. "I think people feel that scientists are not real people with real lives and real prob-

PHOTO COURTESY OF LINDA A. CICERO FOR STANFORD NEWS SERVICE

Carolyn Bertozzi uses Twitter to show the realities of life as a scientist.

CONTINUED ON PAGE 20

CONTINUED FROM PAGE 19

lems that are mundane," says Bertozzi. "I figured I could dispel that myth on Twitter."

Bertozzi belongs to a cohort of scientists who now regularly use Facebook and Twitter for the sake of science. A 2015 report, "How scientists engage the public," from the Pew Research Center, done in collaboration with the American Association for the Advancement of Science, stated that 27 to 47 percent of AAAS members use social media to discuss science or stay abreast of scientific developments. Nearly half of the scientists on social media are looking to attract both specialized and general audiences to their discussions and heighten awareness of the scientific enterprise.

Opening up

Bertozzi wasn't an early adopter of social media. "I never had a Facebook page. I skipped that entire era apparently," she says.

The change happened in 2014 when she became editor for a journal, ACS Central Science, which is published by the American Chemical Society. Some of ACS's employees encouraged Bertozzi to use Twitter to promote the journal.

Initially, Bertozzi was highly skeptical about the value of Twitter. Like other social media platforms, it appeared to revolve around "mostly stupid minutiae," says Bertozzi.

But she soldiered on and started to follow journals that had Twitter feeds. Then she discovered Berkeley's feeds. (Bertozzi's laboratory was based in Berkeley before her move to Stanford in 2015.) The feeds from the different schools on campus helped her plug into various events and research happening on campus.

She soon discovered that a number of universities "have all these interesting Twitter feeds. So I started following Cornell, MIT, Caltech and some Harvard sites," she says. "Then I discovered there were a bunch of chemists who are tweeting, so I started following them. The funny thing is, within a few months, all of sudden, I was so up on current events." The same happened with the scientific literature because of all the journal newsfeeds she was following.

As any overscheduled scientist, Bertozzi notes she doesn't have the time to read news and scientific papers in print or at various websites. However, Bertozzi found she could follow current events in real time on Twitter "when I'm stuck in line at Safeway," she says. "I can do it when I'm at the airport stuck in line. It's all on my phone."

Then, a few months into joining Twitter, came Bertozzi's social-media breakthrough: "By accident, once or twice, I tweeted something original from my own mind."

Those tweets ended up getting shared widely and garnered Bertozzi more followers. She realized that the social media platform was a great way to discuss the various issues facing science and scientists. And she could use the social media platform to show that, despite all her success, she is fallible.

Bertozzi has used Twitter to air her biggest peeves about misconceptions of science ("Chemicals=bad, scientists=old white men, chemistry=boring or all done (where is our Breakthrough Prize!")). She has jumped in on discussions about the purpose of postdoctoral stints ("Postdoc = training/mentored position. Should expect support for job search"). She has given career advice to younger scientists ("Communicate research with story telling skill, understand peoples' motivations, know audience, think big").

Bertozzi also uses Twitter to discuss openly the challenges of a full-time job and parenthood. Bertozzi and her wife have three boys, all under age 8. "This whole idea of work–family

balance — what could be more of a misnomer for your life than the word 'balance'?" she says. "It's a complete joke."

Bertozzi says she believes younger scientists, especially women, need to see that even the most successful people don't have their act together at all times. "Women get this weird impression that somehow, you have to be so perfect to be successful," she says. "That's not true at all." (On Twitter, she has dismissed the idea that she is a perfect mother, following up with a few parenting tips including "Eat ice cream before pizza as lesson in how to blunt insulin spike.")

She recounts a time when she was visiting a university to give a talk and was taken to lunch by some of the graduate students at the university. One of the students couldn't fathom that Bertozzi changes her children's diapers. "It's not like there's a diaper-changing robot under my bed!" she says. "It's hard to know where it started, but people think that you're somehow a different species" when you're a successful scientist.

'I can't believe I let that happen'

Bertozzi doesn't want to set false standards. It's not just on Twitter that Bertozzi is willing to reveal her bumps and bruises. On a "People Behind the Science" podcast that was taped in January, Bertozzi spoke about the mistakes she made when she began setting up a laboratory at Berkeley's chemistry department as a new assistant professor in 1995. Like many junior faculty members, Bertozzi fumbled. "Someone gives you the keys to the car, but you never really learned how to drive," Bertozzi said during the podcast. "You have no experience, really, in managing a research enterprise."

She assumed her first batch of graduate students would be copies of her. "They would have the same commitment to their research, they would have the same ambitions, the same interests," she said during the podcast. "Of course, no two people are alike, much less five people. I found myself frustrated that they couldn't read my mind."

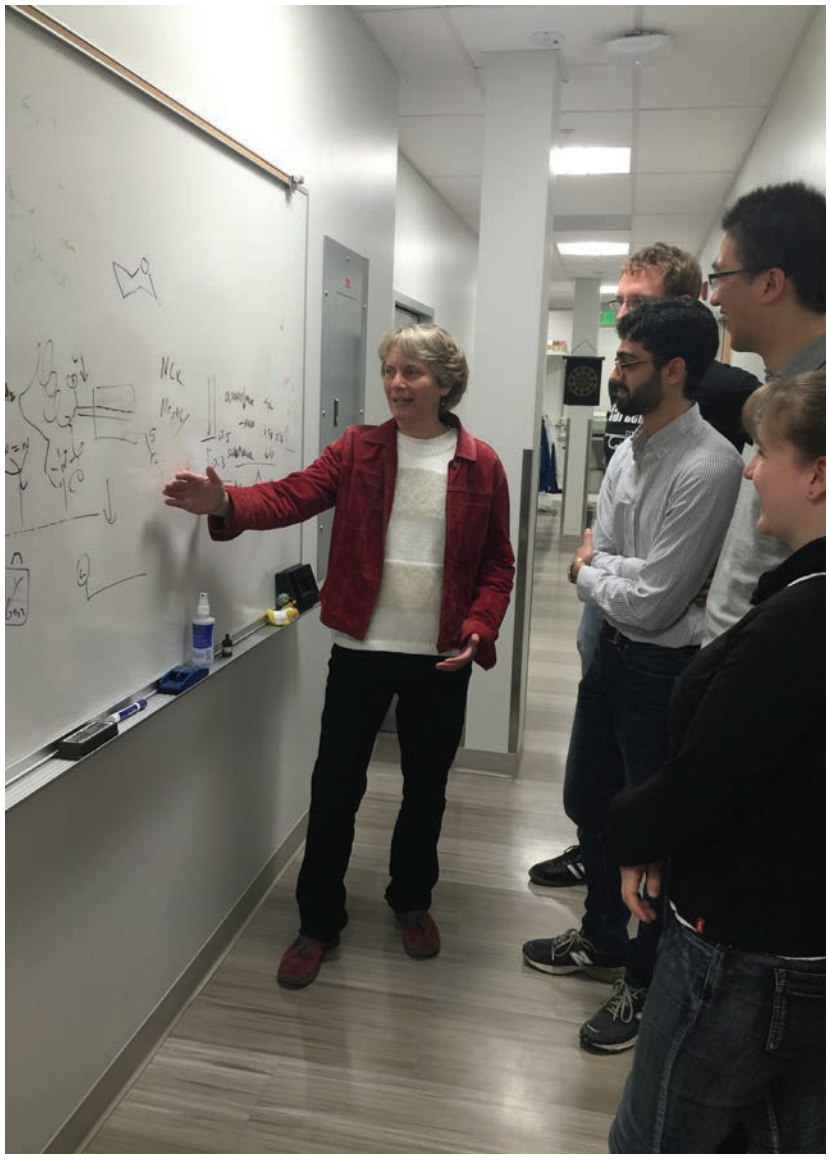


PHOTO COURTESY OF BERTOZZI LAB

Bertozzi is known as a masterful communicator.

Bertozzi soon learned that she had to communicate her expectations clearly. She had to appreciate that different people had different work styles and motivations and that she had to tailor her mentorship and management to the person.

"I had a lot of work to do on my

CONTINUED ON PAGE 22

CONTINUED FROM PAGE 21

soft skills early on. I really screwed up a lot of things. I had students leave my lab out of frustration with me," said Bertozzi in the podcast. "In retrospect, I can't believe I let that happen."

But now, Bertozzi excels as a mentor. "You'll be very hard-pressed to find somebody to say anything bad about Carolyn," says Christina Woo, who recently completed a postdoctoral stint with Bertozzi and is starting her own laboratory at Harvard University. "She is an especially supportive mentor who really gets how to support her postdocs and students."

Marletta sounds rueful about Bertozzi's recent exit from Berkeley. "Carolyn is a fantastic recruiter of students," he says. "Now that she's at Stanford, that's a problem for us here! She has this ability to connect right away. The connection comes from listening to people, seeing what they are like and what they are interested in, and finding a way to intersect with that."

Emotional connection

Marletta and Woo describe Bertozzi as a masterful communicator who knows how to draw in an audience and make them care about what she has to say. She is a consummate storyteller.

Some of her mastery comes from the fact that Bertozzi is a skilled jazz and rock keyboardist who performed in a band in college and seriously contemplated majoring in music. Being a musician has given Bertozzi a taste for the thrill that comes from forming a connection between the person on-stage and the audience. The goal of a lecture, just as in a musical performance, says Bertozzi, is "you're trying to create an emotion that you share with the audience."

Every time she gives a lecture that falls flat, Bertozzi does a postmortem. By asking herself where she lost the audience or lost steam with her delivery, she makes sure that she doesn't repeat those mistakes, and she reviews how she is pacing the narrative. As she puts it, "every lecture you give should have an arc, a story, and it should build up a cathartic moment."

Woo says that she tries to emulate Bertozzi's presentation style because "I've seen people come from totally different chemistry backgrounds go to her talk and come out like 'Wow, I actually learned something from that!'"

Bertozzi understands how leaving out information is as important as leaving in information when telling a story. "She's very much a minimalist when it comes to making slides," says Peter Robinson, a recent Ph.D. graduate from the lab who now is the chief scientific officer of a startup company called Enable Biosciences. "Even though we publish a lot of papers and have a lot of data, if you go to one of her talks, she might summarize an entire project by showing what that group is trying to achieve in a single well-designed slide."

The approach Bertozzi takes to make her lectures compelling mirrors the approach she has toward Twitter. She cares about sharing her passion for research and making science accessible to whomever may be interested.

Bertozzi says her colleagues look at her askance when she's busy taking photos at department functions to tweet. "They laugh at me and think it's so silly because they think of it as a teenage girl's pastime, which is probably what I would have thought a couple of years ago," says Bertozzi. "I feel it's too bad because we're doing ourselves a disservice by disdaining a mode of communication that so many millions of people use. What a waste of an opportunity to show people what you do and who you are."

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the managing editor for ASBMB Today. Follow her on Twitter at twitter.com/rajmukhop.

Sharing science creatively

By Sapeck Agrawal

David Bachinsky launched the company Molecular Creativity in the late 1990s and created a Facebook page of the same name a decade later. His wide-ranging coverage of the whole of molecular biology and biochemistry and his frenetic posting style have made the Facebook page something of a social media phenomenon among scientists and science lovers. He also is active on Twitter with almost 5,000 followers.

Bachinsky did postdoctoral research in pathology, genetics and molecular biology at Massachusetts General Hospital and then became an instructor in nephrology at Tufts University. He followed that up with a position funded by the Howard Hughes Medical Institute at Harvard Medical School.

Sapeck Agrawal spoke to him about his background, how the Facebook page came to be and what inspires its upkeep. The interview has been edited for length and clarity.

When did you start the page, and what motivated you to do it?

Molecular Creativity was incorporated in Massachusetts in 1998 after I finished as a research fellow in genetics at Harvard Medical School. I had decided to not go the academic route but to try consulting — with mixed success. The company ended as a corporation in 2007 when I became a resident scholar and senior scientist at (the biotech company) Intrexon. It was relaunched in 2009 as a mechanism to get some consulting opportunities.

PHOTO COURTESY OF DAVID BACHINKSY

Bachinsky is the force behind Molecular Creativity.

Molecular Creativity's social media feeds highlight interesting science.

What stories interest you?

My interests in molecular, biochemical and cell biology as related mainly to humans are what dominate the Facebook posts. Ideally, the takeaway message for visitors to the page is that health science is really interesting and it can be fun to learn new stuff that makes connections that might have been considered separate and distinct areas of research. I hope to fertilize new ideas in my diverse audience, which seems to be international.

How much time do you spend on the page?

I work alone and post information periodically throughout the day, depending on my schedule. I have about 5,000 followers on Twitter, so I post more stuff on that site — like links to articles — but a subset of those tweets get posted on Facebook. A few hours per week are spent updating information.

Which story has been the most popular so far?

There was a video from Eric Green (director of the National Human Genome Research Institute) that did well about the genomic landscape — history and future directions of genomics from the perspectives of the NHGRI. Reviews and videos seem to get more attention than research articles.

What is the most rewarding aspect of maintaining a page like this?

I like sharing information that I find interesting. I populated a cork board in a hallway with the front pages of the Journal of Biological Chemistry and related journals while a Ph.D. student. I ran the continuing medical education pathology seminar series while at Massachusetts General Hospital. I think communicating science and medical information is an important first step in obtaining funding and support from individuals who might be ignorant of the great progress in biochemical, genetic and medical sciences.

Sapeck Agrawal (sapeck.srivastava@gmail.com) is a medical and science writer with a Ph.D. in molecular biology.

Navigating the murky waters of social media

By Rick Page

Working in a profession where success hinges on securing the next grant or publishing the next big paper, scientists are exceptionally trained to distill complexity into simpler elements. Grant writing may be a scientist's ultimate test in communicating via efficient and effective prose. Twitter is essentially an extreme exercise in efficient and effective writing, albeit with decidedly lower stakes than grant writing and significantly lower odds of getting money for your lab.

So why join the world of social media?

I would argue that never before has the distribution of information been more democratic. Information comes easily to you; communicating your science to a large audience happens incredibly quickly.

I use Twitter to find new papers and new science without having to scour a plethora of journal sites. While not all scientific articles are posted to Twitter, by following a diverse group of scientists on Twitter, I can capitalize on a community of scientists to curate cutting-edge developments and current literature and more quickly identify the most exciting new developments.

Another strong advantage is advocacy. Connecting more scientists to the political process that determines funding levels for the National Institutes of Health and National Science Foundation is a priority for me. I view communicating the importance of biomedical research to our elected officials and the lay public as absolutely necessary. My commitment to advocating for increased and sustained funding for biomedical research is why I joined the American Society for Biochemistry and Molecular Biology's Public Affairs Advisory Committee. I use Twitter as a platform to communicate the significance of biomedical research in both societal and economic terms and to raise awareness for developments in funding. You may share these same concerns and likely have others that you are committed to advancing.

I encourage junior and established scientists alike to join social media to broaden the scope of science they see and to engage with other scientists and the public. Similar to starting a new experiment, a scientist looking to get a start in social media should take stock of some points.

Which platform?

With the plethora of choices available for social media platforms, choosing the best platform can be daunting for those starting out. Twitter, Facebook and LinkedIn are the most widely used social media platforms for scientists.

Twitter is my social media platform of choice. But no matter the platform, on social media, everything is or has the potential to be public. You must consider this point when starting out and posting. As a faculty member, separating my private and professional lives is important. On Twitter, I have separate accounts, one for my personal life and the other for my professional life. LinkedIn is a great tool for networking and is professionally focused, though it tends to be highly compartmentalized into discussion groups for specific subfields, prone to spam, and largely populated by job seekers. Although Facebook is the most popular social media platform in the world, it can be difficult to keep your professional and personal lives separate, although you can, as on Twitter, hold separate accounts for the different parts of your life.

I find Twitter to be natively customizable, easy to learn and great for rapid communication. However, having a quick and easy vehicle for communication does not always mean it is simple to get your message out effectively.

Easy to use, not necessarily easy to do

Consuming information shared by others on Twitter couldn't be simpler. All you have to do is hit the "follow" button on people, organizations and groups that interest you.

Posting your own tweets and making sure they are seen is easier said than done. Writing a tweet that others will not just see but also share (retweet) takes practice. An overarching goal to keep in mind when writing your first tweets is to spark interest. You want your tweet to be succinct yet engage the reader's attention. Think as if you're writing a manuscript title, not an abstract. Try to spur the reader into wanting to

learn more about your subject. One of the best ways to do this is to be yourself; don't try to be an automaton tweeting science 24/7. Inject your thoughts and personality into your tweets and share what you think is interesting and compelling. You also want to make sure that any links you put in your tweet are functional. There is little more frustrating on Twitter than finding an interesting tweet and discovering it features a dead link. It also can be helpful to stick to a theme or a set of themes so that you can become known as a valuable source of information in your area of interest.

The cost of social media

Social media is free, right? Try again. Our colleagues in economics are right: There is no such thing as a free lunch. Everything has costs; even doing a free activity has real costs in that you are choosing to do that activity over something else. For those of us in science, the real cost of spending time on social media is acknowledged infrequently. Particularly for junior scientists, the real price of your time scarcely is mentioned.

As a faculty member with demands for my time coming from many angles and the need to pay for salaries in my lab from grants, the real cost of time is more readily apparent. A key consideration for capitalizing on your social media efforts is to compartmentalize or actively track your time. Twitter can be an efficient mechanism for finding the latest science and promoting your own. But without good time management, you'll find that efficiency quickly devolves into several hours gone with little to show.

Why I enjoy being on Twitter

Whatever your priority, getting onto social media as a scientist provides you with a platform that our predecessors never had. Staying up to date is quick and easy. I can get the information I need whether I'm at my desk or 2,000 miles away. Countless tweets have sparked inspiration for current and future projects in my lab. Tweets have prompted me to incorporate graphic-design principles into figures and presentations and introduced me to exciting new approaches in biochemistry and biophysics. Twitter also provides me with the opportunity to share information about the science, missions and principles about which I am passionate. I encourage all scientists to take advantage of this opportunity for advocacy, to find your topic, to speak your mind and to become a champion for your cause.

Rick Page (pagerc@miamioh.edu) is an assistant professor in the department of chemistry and biochemistry at Miami University. Follow him on Twitter at twitter.com/ThePageLab.

Life on social media in and out of academia

By Bethany Brookshire

"@Inkfish …you had me at 'robotic rectum.'"

I wrote the tweet above over my lunch, giggling silently to myself. It was in response to a new tactile robotic device designed to help doctors train for prostate exams. The phrase "robotic rectum" was just too good to pass up.

But before I hit "tweet," I paused. Smirking over a robotic posterior was fun when I was a postdoctoral fellow writing under a pen name. Now I'm a professional science writer at a respected magazine. Should I really be laughing about robotic nether regions on the internet?

I sent it anyway.

But my brief pause was an important one. It's one that I have kept up rigorously throughout my time on the internet. During my time on social media, I have transitioned from a graduate student to a postdoctoral fellow and then to professional writer. I have written under a pseudonym and under my real name. Over time, the internet has changed. So have I. But my rules for posting have remained the same. There are only two.

Know your audience

When I started out on social media as a graduate student, my audience was primarily other scientists, other science bloggers and science-interested people. Accordingly, I could post inside jokes and stories and write personal things about life inside the ivory tower.

Five years and a career change later, the science-interested people vastly outnumber the other two groups. They like to hear about life in science, but they also want fun, interesting links to science stories they can trust. Robotic nether regions are still entertaining and interesting to this group.

I also now run the social media feeds for "Science News for Students," sending out links to our latest stories and interacting with readers. That job requires the same talent for making links fun and interesting. But that audience is primarily teachers, parents and students. A robot prostate will not fly. My "voice" on social media there is more professional and impersonal.

As a postdoctoral fellow, I used social media sites, such as Twitter, for networking and making personal connections. But as a professional science writer, my focus has shifted. This is partially because Twitter itself has shifted. Science writers tend to use it less personally than in the past. Networking has shifted to private groups on Facebook or to one-on-one direct message conversations. Over time, I have followed the networking from platform to platform to find the connections that fit my needs.

Everyone starts on social media for a different purpose. If you want to network and meet people, that's your

"audience." If you want to share your work, your audience may be different. Knowing who your audience is helps determine what you want to share. But how you share it? That's rule number two.

The cocktail party rule

Any one individual's reach on Twitter, Facebook or other social media platform may be small. But social media is never truly private. Tweets are usually public, Facebook posts often can be shared and even Snapchats can be screenshotted and preserved. The internet is forever.

So before you write that dirty, snarky or slightly mean post, pause. Would you say that at a cocktail party? A big one? One with both children and people over 65? Would you be willing to go back, five years from now, view that post again, and own it?

This doesn't mean everything you post needs to be a momentous statement. But it's worth keeping in mind that your Facebook wall isn't as intimate as it might seem. Bad-mouthing colleagues behind thinly veiled code names may seem satisfying, but people aren't stupid. The brief satisfaction of a well-flung internet barb may not be worth the future blowback.

Social media works best for building connections, not burning bridges. It never hurts to be polite. Text comes without tone of voice or context.

Don't automatically assume the tone is angry or sarcastic.

As I transitioned from working in academia to a nonprofit organization, that sense of caution only has increased. I'm glad to chat and joke, but I'm always mindful that this is not just my personal social media account anymore. This is part of my job. Some of my tweets represent an organization. Even my personal Tweets can reflect on my employer and my colleagues. To be on social media is to be in the public eye.

This shouldn't induce paralysis. It's just a reminder that social media is a public space. Behave accordingly. Be wry, funny, smart and informative. Be yourself. But be an adult.

Or at least be an adult most of the time. Looking back on that tweet about robotic prostate exams from a comfortable day's distance, I don't regret it. I spread the word about a neat piece of technology. And "robotic rectum"? It's still funny.

Bethany Brookshire (bbrookshire@sciencenews.org) is the science education writer, web producer and social media manager for Science News for Students. She runs the blog Eureka! Lab at Science News for Students and the blog Scicurious at Science News. Follow her on Twitter at twitter.com/scicurious.

Promote your paper in four easy steps

By Angela Hopp

Congratulations! You have a new paper coming out. You're proud of your team's work, and naturally you want folks to know about it.

But it's a crowded field out there. According to the International Association of Scientific, Technical and Medical Publishers, scholarly journals published about 2.5 million papers in 2014, and that number increases by about 3 percent annually. Meanwhile, a study published in the journal Research Trends found that "the number of authorships has increased at a far greater rate from 4.6 million in 2003 to 10 million in 2013."

Translation: On any given day, you're one of about 27,000 scholars vying for 15 minutes of fame.

The good news for you, though, is that most of those 27,000 people aren't going to have promotion plans in place. But you will — if you follow the steps below.

STEP 1: When your paper is nearing acceptance, contact the press office at your institution or company.

Press offices are staffed by professional storytellers. They're there to help you tell your research story. If you do a good job of explaining your work to your press office, it could distribute a news release to reporters, write an article or blog post, shoot a video, and/or share the paper on social media.

Note: Ask the journal for its embargo policy in advance and share the policy with your press office. For more information about working with a press team on a press release, see "Go ahead, brag a little" in the March 2011 issue of ASBMB Today.

STEP 2: Draft verbiage explaining the work.

Prepare written descriptions of your project and findings in different ways.

Start with a one-sentence explanation of the work. When I share papers on Twitter, which limits tweets to 140 characters, I usually start with the running titles. Running titles are short and, in the best cases, not laden with acronyms. This gives me room to tag the respective journal (for example, @JBiolChem) and include a link to the paper.

Now work on a blurb about three or four sentences long. It's OK to start with "My team" or "I'm happy to share." Make sure readers know this is about your accomplishment. A really great blurb will present the problem, the results and the potential impact. It's a tall order but worth the time it takes to write, rewrite and rewrite.

STEP 3: Gather appropriate visuals.

I'm sure I don't have to throw a bunch of data at you about the power of visuals. I mean, really, who hasn't gotten sucked into those video recipes on Facebook? We all agree: Images matter.

Identify a figure from your paper that best tells your story. If you have two or more illustrations that are related, you could combine them into an animation (GIF).

If you don't have an image to share, find an image of the cover of the journal. Here's a cheat sheet with all the image specs for social media platforms: http://makeawebsitehub.com/social-media-image-sizes-cheat-sheet/

If you have video footage, make sure it's in a shareable format. If you don't have a video, make one. Your press office might be able to send a videographer to your lab, but the truth is that even a cellphone video will do the trick. Write a quick script that tells your research story in under a minute. Practice it. Shoot!

STEP 4: Once your paper is published, share your news widely.

Email: First, modify your automated signature line so that it includes a link to your paper. (Example: "Check out my new paper on plasma fatty acids in the Journal of Lipid Research!") Second, write to your colleagues. You can use the three- or four-sentence blurb you already drafted. If your press office wrote a news release, share a link to it and a link to your paper. Important: Be a good manager and/or team member and publicly praise your co-authors for their individual contributions.

LinkedIn: First, add the paper to your publication list. Second, prepare a status update. You can use the one-

sentence explanation you've already written. Tag your co-authors, your institution and the respective journal in the post.

ResearchGate: Update your publications list.

Twitter: Prepare a tweet. You can use the one-sentence description you've already written. Upload an image or GIF. Tag the respective journal (and your institution if there's room). Tweet this a few times over several days, making sure to post other stuff in between, because your followers might miss it if you tweet it just once.

Facebook: Prepare a status update using the three- or four-sentence blurb you've already written. Upload your image, GIF or video. Tag the journal or its publisher (for example @ASBMB). Now, you might be thinking that Facebook isn't an appropriate medium for you because your Facebook friends aren't scientists. I hear you, but I still recommend doing it. Let them be proud of you too. Show them that their tax dollars are hard at work.

YouTube: If you have video footage, upload it and use your three- or four-sentence blurb as the video description. Reminder: YouTube is a search engine, second only to Google in terms of usage.

Webpage/blog: Update your institution/company webpage and/or blog. Use the blurb you've written, images and video. If you have a press release, link to it too.

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

Climbing the social media ladder

Take advantage of popular social media platforms to promote your work and connect with the scientific community.

By Allison Frick

Facebook

By building an audience and connecting with individuals who follow you on Facebook, you can create a far-reaching web through which to disseminate information. Share links to your publications or upload images and videos related to your work.

**Think of it as promoting your work by online word of mouth.*

LinkedIn

Update your professional profile on a regular basis so that your credentials, employment history, links to papers, and a list of honors and awards you've received are current and visible to people who search for your profile. LinkedIn reports that it has more than 433 million registered members. It's a vital tool for starting and maintaining professional relationships.

**Think of it as digital networking.*

Twitter

Twitter is a quick and efficient way to showcase the scientist behind the publication. By sharing links to your work and interacting with other Twitter users, you're able to build credibility in the online scientific community and establish a direct rapport with those who are interested in your work.

**Think of it as a grassroots effort to showcase your research.*

Mean girls with Ph.D.s

By Marney A. White

As an academic in public health, I teach hundreds of students every year and publish mostly in scholarly journals and books. My work is semipublic, so I am used to scrutiny from people who do not know me as a person. I've been brutally criticized by journal reviewers, attacked by trolls in the popular media and insulted in course evaluations — all anonymously, of course.

It's never fun, but I've found ways to cope. It helps to commiserate with other professors about bad reviews and to realize that even my very best and most lauded colleagues also receive intensely negative evaluations on occasion from students.

I was in search of just that sort of empathy when I joined a Facebook group for academic mothers. Here I expected to find women who could relate to one another, as we juggled the same sorts of demands on our personal and professional lives.

Perhaps that's why it hurt so much to see myself criticized on that Facebook page after The Washington Post published an essay I wrote this past spring on balancing an academic career and motherhood. In that column, I encouraged female academics who have children to be more vocal about motherhood so that they could serve as role models to students who might want to pursue both family and academic goals.

Some members of the Facebook group seemed to like my ideas. Others found my opinions to be invalid since I'm on the faculty at Yale University and things are "easier" at Yale. Those critics interpreted my column in the Post as a condescending lesson in how to achieve tenure, which is disheartening, because I do not have tenure and never will. I'm an associate professor on the medical school's educator track, which does not lead to tenure.

But the part that really got to me was when these highly accomplished, incredibly smart women started criticizing the photograph of my family that accompanied the article. When I submitted the piece for publication, I attached a family photo that had been taken on the campus. I liked it because the university library appeared in the background, which I thought was symbolic. In the photo, my husband is holding our son on his shoulders, and I am looking up at my son's face. I was quite happy when the publication told me they wanted to run the photo with my essay.

I was unprepared for the personal nature of the attack. An associate professor at a flagship state university wrote, "Does anyone else think the photo is weird? She is the author yet her husband is looking at the camera while she is looking adoringly at their kid." (The piece is about motherhood: Am I not allowed to adore my child?) An associate professor at a small liberal-arts college replied, "I hate so much about the photo I can't even read the piece." A professor at an Ivy League university chimed in, "The photo made me want to gag as well." Insult after insult filed in, many acquiring "likes" — virtual applause — while I watched it all in real time.

Face flushed and heart pounding, I wrote "Thank you!" on the same thread. And the thread went silent for a few hours, until one person stepped forward to write, "I think the photo is loving and sweet." I thanked her, noting that I had not expected to be criticized for the way my family appears in a photo, and posted a meme of "Mean Girls." Immature? You bet.

I wanted them to know that they were saying these things, in the virtual sense, to my face. In response to my speaking up, people started removing their comments. Several women apologized publicly, and others emailed me directly to apologize.

Online forums provide enough distance from the target of attack that virtual name-calling — and career slamming or family bashing — might be viewed as acceptable behavior. But once people are faced with the reality that they are insulting someone directly — a real person and not just the two-dimensional stereotype they've imagined — they are uncomfortable. The woman who hated my family's photo so much that she "could not read the piece" resented being called a mean girl.

A half a century ago, a psychologist named Milton Rokeach talked about the power of "self-confrontation" in motivating behavioral change. The basic notion is that, being the fallible creatures that we are, we sometimes behave in ways that do not match up with our personal values. For example, in theory, women might value being kind to and supportive of other women. But in practice we might behave in catty ways. When forced to step back and observe our own cattiness, we might become extremely uncomfortable. That discomfort should motivate change — either in behavior or in values. In my story, many women immediately changed their behavior when I pointed it out.

We as humans have been known to be a cruel lot. We want to think of ourselves as nice people (and many of us are), yet even the nicest of us shows signs of cruelty when threatened.

DREAMSCAPE STUDIO

The author received personal attacks on Facebook after publishing an essay with this photo in The Washington Post.

Research on bullying has identified that bullies (a.k.a "relational aggressors") are struggling with insecurities of their own. They engage in bullying as a means to boost their own popularity or security within their peer group.

This is nothing new — and we don't need Facebook as a medium to confirm how nastiness accelerates in a group. All of us are susceptible to it, but not many of us want to think of ourselves that way.

In my case, once my peers understood that their comments were hurting a real person, many backed off. Perhaps online trolling and less extreme forms of public criticisms are just that: A failure to recognize that there are real people at the other end of the attacks.

What this experience taught me is that abusive online behavior is not relegated to teenagers and anonymous internet trolls. Mean girls can be found in a wide variety of places, even those that we presume to be safe havens. But I also learned that when people realize that they are hurting a real person, they tend to regret it. And that gives me a lot of faith in the overall goodness of people. Even though they sometimes can be really mean.

Marney A. White (marney.white@yale.edu) is an associate professor of chronic-disease epidemiology and psychiatry at the Yale School of Public Health.

This article originally appeared on June 13, 2016, in the Chronicle of Higher Education.

DREAM girl

By Sonia C. Flores

She walked into my office full of hope and a passion for science. She was determined to go to graduate school and focus on a research career so she could spend her life asking those questions that her natural curiosity had always sparked in her. She had outstanding grades and the fire in the belly required for research success. But after a summer of working in my lab, the reality of her life — an existence undercut by uncertain immigration status — hit her smack in the face.

Lucero was not like other students. She was a DREAMer, a minor who was not an American citizen but who had spent much of her life in the U.S. Lucero was one of the many young people who would benefit from passage of the bipartisan Development, Relief and Education of Alien Minors, or DREAM, Act. Among other things, the DREAM Act would allow for conditional and then permanent residency status for students like Lucero. During that time, she could apply for student loans and work-study programs and, once given permanent status, federal grants. However, while she was working in my lab, I was unable to pay Lucero with funds from federally funded grants, which brought this issue to my attention.

Students like Lucero, brought to this country by their undocumented parents while very young, grow up here and go through our public school system but encounter a firewall when attempting to access higher education. Although I was able to secure institutional funds to pay for her participation in our summer research program, the uncertainty about her future forced Lucero to re-evaluate her career plans. To help lift her family out of poverty, she decided to change her major and seek a business degree, hoping that there would be a high-paying job after graduation. Our nation had just lost a brilliant scientific mind to unfair policies that ignore the plight of the immigrant wanting to call America home.

Despite repeated revisions, the DREAM Act has never been approved by the U.S. Senate, although California and some other states do have their own versions of the act in place, most of which allow for privately funded college scholarships. In June 2012, President Barack Obama announced an expansion or reinterpretation of the DREAM Act with an executive action called Deferred Action for Childhood Arrivals, or DACA. This policy finally allows implementation of some aspects of the DREAM Act and permits some undocumented immigrants who entered the country before their 16th birthday and before June 2007 to receive renewable two-year work permits and exemption from deportation. DACA grants lawful presence in the United States; work authorization; Social Security numbers; and, in many cases, state IDs and driver's licenses, all of which make application to medical and graduate schools possible (1, 2).

However, DACA has very rigorous provisions: Qualifying undocumented youth are eligible for a six-year-long conditional path to citizenship that requires completion of a college degree or two years of military service. Individuals and institutions who have supported the DREAM Act believe that DACA is a vital action that will benefit the U.S. as a whole. DACA gives undocumented immigrant students who have been living in the

How to qualify for the DREAM Act

The following is a list of specific requirements for a person to qualify for the current version of the DREAM Act:

- Must have entered the U.S. before the age of 16
- Must have been present in the U.S. for at least 5 consecutive years prior to enactment of the bill
- Must have graduated from an American high school, or have obtained a GED or have been accepted into an institution of higher education (i.e., a college or university)
- Must be between the ages of 12 and 35 at the time of application
- Must have good moral character

U.S. since they were young a chance to contribute to the country that has given so much to them and a chance to use their hard-earned education and talents (3).

For all of DACA's positives, there are still many challenges for students like Lucero. DACA students don't qualify for federal student loans, and they can't be appointed to the National Institutes of Health-funded training grants or pipeline programs, regardless of merit. This issue makes it hard for program directors like me to fund eager and talented students like Lucero. In addition, potential mentors essentially are discouraged from accepting these students into their labs, because it is almost impossible to find funding for them.

The NIH has very strict guidelines regarding who may be appointed to pipeline programs like the Initiative for Maximizing Student Development, Research Internships in Science and Engineering, or Maximizing Access to Research Careers and regarding who may be eligible for minority supplements to research grants and training grants. According to the National Institute of General Medical Sciences website, "To receive salary support from (these programs), students must be a citizen or a noncitizen national of the United States or have been lawfully admitted for permanent residence at the time of appointment." These rules clearly exclude DACA students (4).

Unfortunately, many scientific societies that have partnered with the NIH or have their own scholarships (at the American Society for Biochemistry and Molecular Biology, we offer the Marion B. Sewer Distinguished Scholarship for Undergraduates) have adopted the same rules. As a member of the ASBMB's Minority Affairs Committee, I specifically brought this question to our discussions of who should get funded. My concerns were considered very seriously. At the same time, I contacted the NIH to get some clarity and received the response, "We are discussing this issue." It is apparent that an act of Congress will be required to overcome these obstacles. In this election season, this may be an issue that Congress refuses to address.

About 65,000 undocumented students graduate from American high schools every year (5). These students want to be treated with respect and allowed to fulfill their promise in this nation they call home. Unfortunately, they often are demonized and insulted with the title of "illegals" and live in constant fear of deportation. This is especially heartbreaking for them as they have lived in the U. S. for most of their lives and want nothing more than to be recognized as "the people" referred to in the preamble to the Constitution.

The fate of DREAMers like Lucero, and of parents of U.S. citizens or green card holders, is currently uncertain. The Obama administration announced the Deferred Action for Parents of Americans and Lawful Permanent Residents, or DAPA, program, which protects parents of children born in the U.S. from deportation, in November 2014 (6). Texas and 25 other states filed a lawsuit to block DAPA in December 2014, prompting an injunction by a U.S. district judge two months later. The argument by Texas and 25 other states

CONTINUED ON PAGE 34

Funding support and resources for DACA students

There are a few funding options for DACA students. These include:

• TheDream.US is a new multimillion-dollar National Scholarship Fund for DREAMers, created to help immigrant youth who've received DACA achieve their American dream through the completion of a college education.

• Catholic institutions of higher education and schools of medicine like Loyola have been at the forefront of accepting DACA students and helping to fund their education.

• States like New York, Illinois and Rhode Island offer in-state tuition to any student who meets certain criteria, like attending a local high school, regardless of immigration status. Three states — California, New Mexico and Texas — go a step farther than the rest, allowing undocumented immigrants to access state financial aid.

• The UndocuScholars Project; The Institute for Immigration, Globalization, and Education; University of California, Los Angeles

CONTINUED FROM PAGE 33

is that the president did not have the authority to issue the new immigration policies and that the programs violate the Constitution. High court justices heard oral arguments April 18, 2016. On June 23, the DREAMers and their families received the heartbreaking news that the Supreme Court was deadlocked (7). The court came back with a 4-4 vote on immigration, allowing the lower court ruling to stand and leaving Obama's deportation relief plan in limbo.

The ruling could affect the growing number of graduate and medical students with DACA status across the country and jeopardize the funding invested in their training. Sixty-one medical schools now accept applications from DACA applicants. According to data from the Association of American Medical Colleges, in 2014 there was an eigthfold increase in medical school applicants who identified a DACA status (8).

We stand at an important juncture in our nation, lamenting the lack of diversity in STEM disciplines and in healthcare delivery. The National Science Foundation and the National Academies have recognized "the national need for a well-trained workforce in biomedical and behavioral sciences and the continuing importance of developing and maintaining a strong, vital scientific workforce whose diversity reflects that of our nation. Students from certain racial and ethnic groups, including blacks or African-Americans, Hispanics or Latinos, American Indians or Alaska Natives, Native Hawaiians and other Pacific Islanders, currently comprise 39 percent of the college age population (U.S. census bureau), but earn only 17 percent of bachelor's degrees and 7 percent of the Ph.D.s in the biological sciences" (9). Active interventions are required to prevent the loss of talent at each level of educational advancement (10).

I posit that these DREAMers represent a pool of highly talented and motivated students that, if tapped, would go a long way to address our health inequities and disparities. As a nation, we have to weigh the benefits of allowing these students access to the same educational and training opportunities that citizens enjoy

Unfortunately, for Lucero, it is too late. When faced with the daunting task of funding her education and getting a good job after graduation, she made the only choice that made sense for her family. It broke my heart, but compelled me to write this article.

I close by quoting the civil rights activist Cesar Chavez, who perfectly encapsulated my feelings about the despair and injustice faced by Lucero and others like her when he said, "We draw our strength from the very despair in which we have been forced to live. We shall endure." It is time we acknowledge these students and grant them the respect they deserve in our nation.

REFERENCES

1. https://www.nilc.org/issues/daca/
2. https://www.uscis.gov/humanitarian/consideration-deferred-action-childhood-arrivals-daca
3. http://www.immigrationpolicy.org/issues/DREAM-Act
4. http://grants.nih.gov/grants/guide/pa-files/PAR-14-121.html
5. http://www.immigrationpolicy.org.
6. https://www.nilc.org/issues/daca/dapa-and-expanded-daca-programs/
7. http://www.huffingtonpost.com/news/daca/
8. https://www.aamc.org/data/
9. National Academy of Sciences. 2011. Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads. Washington, D.C. The National Academies Press; National Research Council. 2011; Research Training in the Biomedical, Behavioral and Clinical Research Sciences. Washington, D.C. The National Academies Press; National Science Foundation, National Center for Science and Engineering Statistics. 2013; Women, Minorities, and Persons with Disabilities in Science and Engineering. 2013. Special Report NSF 13-304. Arlington, VA.
10. https://www.nigms.nih.gov/Training/Pages/TWDPrograms.aspx

Sonia C. Flores (Sonia.Flores@ucdenver.edu) is a professor of medicine at the University of Colorado School of Medicine.

Creating a robust research enterprise

By Wes Sundquist & Benjamin Corb

More than two years ago, the Public Affairs Advisory Committee at the American Society for Biochemistry and Molecular Biology began focusing time and effort on identifying systemic problems facing the scientific research community. Funding, or lack thereof, obviously has added considerable stress, but other issues also need to be addressed to optimize the effectiveness and sustainability of the biomedical research enterprise. We've written about these efforts in the "News from the Hill" columns in ASBMB Today, researched scholarly works by luminaries in the research community and published our findings in a scientific publication (1). In addition, in February, the PAAC hosted a multiday summit to identify what the scientific community can do to improve itself and the future of the field that we love.

In the columns published in ASBMB Today and the Policy Blotter, the PAAC's blog (policy.asbmb.org), we've shared with the community our thoughts and experiences regarding how best to ensure into the future a robust and sustained biomedical research enterprise. We've formed partnerships with organizations that have complementary interests, such as Rescuing Biomedical Research (now directed by former ASBMB policy analyst Christopher Pickett) and the Future of Research. We've identified a series of recommendations for improving the research enterprise that are specific and enjoy broad support within our community; we are taking actions to ensure that these recommendations are achieved.

In the following months, essays by different PAAC members and our partners will appear in ASBMB Today, describing the actions we're promoting and explaining their underlying rationales. For example, we'll discuss the importance of optimizing the roles of staff scientists in the future, the merits of standardizing postdoctoral positions, and the best approaches for defining what a sustainable enterprise looks like and setting research funding levels to achieve sustainability.

With these essays, our goal is to explain what we are doing and to open conversations with our colleagues. We acknowledge that many of the issues are complex and that we may disagree on the wisdom of specific steps or actions. However, we are confident that we all agree that the American biomedical research enterprise is so important that we must pursue activities that will help to sustain our field well into the future.

REFERENCE

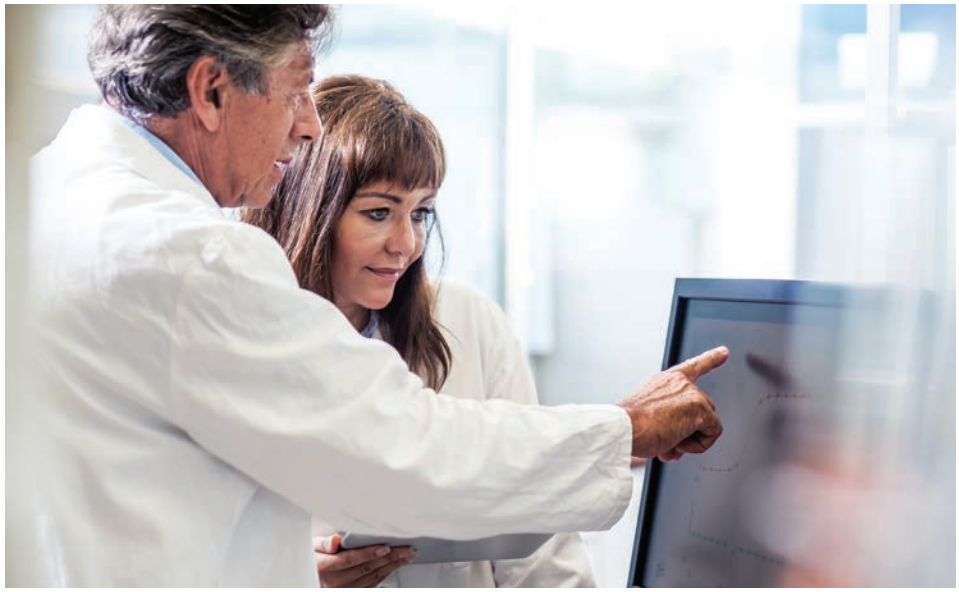
1. Pickett, C. L., *et al. Proc. Natl. Acad. Sci.*, **112**, 10832–10836 (2015).

Wes Sundquist (wes@biochem.utah.edu) is chairman of the ASBMB PAAC and co-chair of the department of biochemistry at the University of Utah.

Benjamin Corb (bcorb@asbmb.org) is the director of public affairs at the ASBMB.

Some thoughts on lab communication

By Arjun Raj



I recently came across a nice blog post by Ambika Kamath, a graduate student at Harvard University, about tough love in science (1). A passage really stuck out:

"My very first task in the lab as an undergrad was to pull layers of fungus off dozens of cups of tomato juice. My second task was PCR, at which I initially excelled. Cocksure after a week of smaller samples, I remember confidently attempting an 80-reaction PCR, with no positive control. Every single reaction failed … I vividly recall a flash of disappointment across the face of one of my PIs, probably mourning all that wasted Taq. That combination — 'this happens to all of us, but it really would be best if it didn't happen again' — was exactly what I needed to keep going and to be more careful."

What I love about this quote is how it perfectly highlights how good communication can inspire and reassure — even in a tough situation — and how bad communication can lead to humiliation and disengagement.

I'm sure there are lots of theories and data out there about communication (or not), but when it comes down to putting things into practice, I've found that having simple rules or principles is often a lot easier. One that has been particularly effective for me is to avoid "you" language. Just avoid saying "you!"

I've been following that rule for some time. There's a relatively simple principle beneath it: If you're saying something for someone else's benefit, then good. If you're saying something for your own benefit, then bad. Do more of the former, less of the latter.

How does this work in practice? Let's take the example from the quote above. As a (disappointed) human being, your instinct is going to be to think, "Oh, man, how could you have done that?" But avoiding "you" language will help you to find a more productive response.

Obviously there are counterproductive statements that avoid "you" language as well: "Well, that was disappointing!" "That was a big waste" "I would really double-check things before doing that again." These are incorrect to say. I think the last one hurts as well.

Let's dissect the real reasons you would say, "I would really double-check before doing that again." Of course the trainee is going to be feeling pretty awful — people generally know when they've screwed up, especially if they've screwed up badly. Anyone knows that if you screw up big, you should probably double-check and be more careful next time. So what's the real reason behind telling someone to double-check? It's basically to say, "I noticed you screwed up, and you should be more careful."

Ah, the hidden "you" language is revealed! This sentence really is about giving yourself the opportunity to vent your frustration.

So what to say? I think the answer is to take a step back, think about the science and the person, and come up with something that is beneficial to the trainee. If they're new, maybe you could say, "Running a positive

control every time is really a good idea," (unless they already realized that mistake) or, "Whenever I scale up the reaction, I always check …"

These bits of advice often work well when coupled with a personal story: "I remember when I screwed up one of these big ones early on, and what I found helped me was …" Sometimes, I will use a mythic figure from the lab's recent past, since I'm old enough now that my personal lab stories sound a little too "crazy old grandpa" to be very effective.

It is also possible that there is nothing to learn from this mistake and that it was just, well, a mistake. In that case, there is nothing you can say that is for anyone's benefit. It really is just better to say nothing. This can take a lot of discipline, because it's hard not to express those feelings right when they're hitting you. But it's worth it. If it's a repeated issue that's really affecting things, there are two options: address it later during a performance review or don't. Often there's honestly not much difference in outcome between these options, so maybe it's just better to go with the second one.

Another common category of negative communication is all the sundry versions of "I told you so." It is so clearly accusatory that most folks know not to say it. But I think this is just one of what I call "scorekeeping" statements, which are ones that serve only to remind people of who was right or wrong: "But I thought we agreed to …" or "Last time I was supposed to …" They're very tempting, because as scientists we are in the business of telling each other that we're right or wrong. But when you're working with someone in the lab, keeping score of these types of points is corrosive in the long term. Just remember that the next time your principal investigator asks you to change the figure back the other way around for the fourth time!

Along those lines, I think it's really important for trainees, not just PIs, to think about how to improve their communication skills. I often hear people say, "Before I was a PI, I got all this training in science, and now I'm suddenly supposed to do all this stuff I wasn't trained for, like managing people." I actually disagree. To me, the concept of managing people is sort of a misnomer, because in the ideal case, you're not really managing anyone at all but working with everyone as equals. There should be an equal stake and commitment to productive communications, so all parties should learn and improve.

Few of us are born with perfect interpersonal skills, especially in work situations, and extra especially in science, where things go wrong all the time. It practically begs for people to assign blame to each other. It's a lot of work, but a little practice and discipline in the area of positive communication can go a long way.

Arjun Raj (arjunrajlab@gmail.com) is an assistant professor in systems biology at the University of Pennsylvania. This post originally appeared on the Raj Lab blog, http://rajlaboratory.blogspot.com.

REFERENCES

1. https://ambikamath.wordpress.com/2016/05/16/on-tough-love-in-science/

Pointers for those curious about careers in industry

By Angela Hopp & Rajendrani Mukhopadyay

This is the second article from a three-part series of interviews with Kenneth I. Maynard of Takeda Pharmaceuticals International Inc. about what it takes to launch and propel a career in the pharmaceutical industry. The first piece appeared in the August issue of ASBMB Today and gave tips on how to begin looking for industry positions.

Maynard previously worked for Sanofi, Aventis Pharmaceuticals, Massachusetts General Hospital and Harvard Medical School. He is a member of the National Institutes of Health Common Fund's External Scientific Panel for the Broadening Experiences in Scientific Training program. This Q&A has been edited for length, style and clarity.

How important are internships when it comes to finding a job in industry?

Internships are not critical to finding a job in the pharmaceutical industry, but they do provide advantages for the applicant. As with any internship experience, working in an environment where you may eventually want to work could provide you with important and relevant experience to help decide whether this is the type of job you really are seeking for the future.

An internship also provides real-world experience that is very different from working in academia. Despite having many of the same basic skills in terms of technical excellence, more emphasis is put on process, timelines and working in teams. One potential significant advantage is that in a few cases, an internship potentially could lead to a full-time position in the same company, if there happens to be an opening for a full-time employee and there is strong interest on the part of both the company/employer and the intern/potential employee. It's the perfect fit. In rare situations, a company may even create a position for exceptional interns.


Kenneth Maynard

Should a candidate wait until he/she publishes original work before applying to industry?

Depending on the position being considered, publications can provide a competitive advantage. First, publications can indicate that the candidate is an expert in a specific area of knowledge or with certain scientific techniques. Second, publications can illustrate to the hiring manager that the candidate can prepare professionally written documentation of his or her scientific work, which is important for regular scientific reports. Scientific reports, which include full documentation of experiments, their results and interpretation, are important documents in the pharmaceutical industry.

However, for some entry-level bench positions, it is not necessary to have publications as long as you can provide evidence or strong references, to convince the company that you have the specific skills it is seeking. Depending on the position and the candidate, it is understood that publishing your scientific work may not have been possible if you were working formerly in a pharmaceutical company that discourages publication of internal scientific work in order to protect intellectual property. In today's academic climate, it is even possible that a principal investigator or an academic institution may have suspended publication of academic work pending a patent application. With this in mind, patents carry as much weight for a position in the pharmaceutical industry as publications in international, peer-reviewed journals.

Is it worth doing a postdoctoral fellowship before applying to industry positions?

The answer is, "It depends." It depends on what type of career you are seeking in the pharmaceutical industry.

If you are seeking to enter the pharmaceutical industry at the level of a group leader, principal scientist or higher, with visions of being upwardly mobile, then it is to your advantage to have an academic postdoctoral fellowship experience or, even better, apply after having achieved the position of an assistant professor. The postdoc-

toral fellowship is typically a period where the fellow is developing his or her own area of scientific interest and honing research skills. A fellow may develop a novel set of investigative questions for grant proposals and even get these funded. This process shows to potential pharmaceutical industry employers that the candidate has credibility within his or her scientific field. The higher the level at which you wish to enter a company, the higher along the academic track you should be to transition into industry.

However, if you do not wish to have managerial responsibilities and wish to stay at the bench level, perhaps performing routine assays, then there is no need to perform an academic postdoctoral fellowship if the skills you already possess are demonstrable. In fact, there are positions at the B.S./M.S. level that do not require having an academic postdoctoral experience. However, note that it can be challenging, though not impossible, to move up the ladder over time from this point of entry into the pharmaceutical industry.



Angela Hopp (ahopp@asbmb.org) is the ASBMB's communications director and ASBMB Today's executive editor. Follow her on Twitter at www.twitter.com/angelahopp.

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the managing editor for ASBMB Today. Follow her on Twitter at twitter.com/rajmukhop.

The smallest bundle and the biggest transition

By Samarpita Sengupta

PHOTO COURTESY OF SAMARPITA SENGUPTA

The author changed her career path after the birth of her son.

This year, as the snow-dusted footsteps of spring approached and the earth woke up to a riot of colors, I thought of the transitions that happened for the earth and for its inhabitants. My life has been that of a nomad, traveling from one phase to the other, transitioning with all degrees of difficulty from one stage to the next.

My first major transition was when I left home for college. I moved away from family, friends and the small town of Ranchi in the state of Jharkhand, India, where I grew up to New Delhi, one of the biggest cities in the country and the nation's capital. I got to live in a dormitory with roommates for the first time. Part of me was thrilled at the newfound independence, but part of me was homesick the whole time. Having led a sheltered life so far, I had to adjust quickly to living alone, being responsible for myself and cultivating the necessary social skills to get along with my peers. However, soon this transition became a stable state. I gathered a great group of friends around me and met the love of my life!

Then came another change when I traveled across continents and several time zones to end up at the University of Texas Southwestern Medical Center for graduate school. I came in wide-eyed, naive and incredibly confident of charting a career trajectory to stardom in science!

I did fairly well, but my dreams of science superstardom were starting to fade as the reality of the fierce competition began to sink in. Nevertheless, I decided to embark on the postdoctoral path, partly to be sure this was not what I wanted to do. But after three years of my postdoctoral stint, I was most certain pursuing bench science wasn't making me happy.

The realization came to me after a major event occurred during my second year as a postdoctoral fellow. The most life-changing transition came my way, packaged as a stork-delivered tiny bundle of joy. By far, parenthood was the most difficult transition for me. Every parent is all too familiar with the struggles of the first child. The exhaustion of caring for a newborn, the constant feeling of wanting to do the best for that new life you have brought home, and the equally

constant fear of not being able to do so are all part of the roller coaster of parenting. In addition, juggling parenting and a full-time career is incredibly demanding. Having a child meant my world was turned inside out in the best possible way, making me re-evaluate my priorities.

Having been raised an independent and fiercely feminist woman, I found it initially very hard to do that re-evaluation. I wanted to have it all! I wanted to have an academic career and still be a mother who bakes homemade cookies for the bake sale! However, coming back to work after seven weeks of maternity leave — I couldn't afford to take unpaid leave, a rant for some other time — I found it very difficult to find my groove. It was a constant fight between wanting to be with my baby and wanting to excel in science. I couldn't bear to come to lab on weekends, since that was the only time I could be a fully hands-on parent! "Is this worth it?" was a question I often asked myself.

With time, things got easier, and I started to enjoy work again and worry less about my child going hungry. But I also came to a realization that being at the bench wasn't going to give me the career I wanted. I absolutely did not want to get stuck in a rut as a perpetual postdoctoral fellow, so leaving academia for the pursuit of a nontraditional path seemed logical. However, I still fought with myself. Was I giving up? Coming to terms with the fact that I had limitations, both personal and situational, was humbling and a turning point in my adult life.

After a lot of introspection and talks with an incredibly supportive spouse, I finally realized that the question I should be asking myself was "Is my current status quo making me happy?" When I asked myself that question and realized the honest answer was an unequivocal no, it was time to determine what it was that would make me happy.

I have had a love affair with words from early childhood. As a graduate student and a postdoctoral fellow, I enjoyed writing about science more than actually doing the bench work. A load lifted off my shoulders when I decided to trade the pipette for a pen. I was still going to have a career, be a role model to my kid, but now I would have more time to be a mother. I started volunteering to write articles and networking with people who knew how to write and made several professional and some personal friendships in the process. Last year, I transitioned into the position of a scientific research writer at UTSW thanks to one of those friendships. So far, it has been a fun ride!

Looking through the rearview mirror of memories, I realize that each transition state was a new mold into which I had to fit by changing my priorities, attitude and approach. No matter how difficult and life altering each transition has been, they have all had a purpose. Transitions give me the power of perspective, a power I can wield at each new transition that life throws my way.

Samarpita Sengupta (samar.sg@gmail.com) is a scientific research writer in the neuroscience research development office at the department of neurology and neurotherapeutics at the University of Texas Southwestern Medical Center.

The Do-Over

If you could erase a part of your life and do it over again, which part of your life would that be? What would you do differently?

For an essay series in 2017, ASBMB Today is asking its readers to send in essays about do-overs. Maybe you regretted your choice of college. Maybe you trusted someone who let you down. Perhaps you wonder what would have happened if you had picked that other research project. Whatever it is, be honest and true.

Essays must be unpublished and between 500 to 1,000 words. Submissions can be sent to **http://asbmbtoday.submittable.com/** submit under "The Do-Over." **Deadline: Dec. 1**. Please include in your essay a title, complete contact information and an author bio of no more than 50 words.

Science on the cover

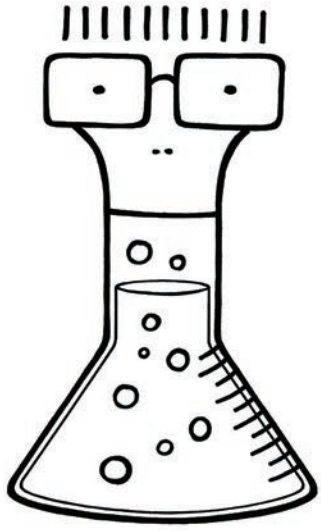
By Geoff Hunt & Rajendrani Mukhopadhyay

Caffeine has been a central player in the story of the pop-punk band Descendents. "From our history, that's an important molecule to us," says lead singer and coffee aficionado Milo Aukerman. The band's merchandise has featured the slogan "Thou Shalt Not Partake of Decaf," and the cover for the 1997 EP "Sessions" featured a large coffee mug. Yet caffeine never has been featured in quite the way that it is on the cover of their latest album, "Hypercaffium Spazzinate."

Nearly every Descendents album cover going all the way back to their first release, "Milo Goes to College," has featured the band's mascot, an iconic cartoon caricature of Aukerman with square-rimmed glasses and flat-top haircut. For their first album after a decade-long hiatus from recording, the band has continued this tradition, using an image of the Milo mascot perched on top of an Erlenmeyer flask and flanked by two graduated cylinders. But just having a cool-looking image wasn't enough.

That's where caffeine enters the story. Inspired by their love of caffeine as well as Aukerman's background as a research biochemist, the band members decided that the cover should depict the Milo caricature making hypercaffium spazzinate, a fictional molecule that is stronger than caffeine. "What's more important than caffeine than to make an even more potent version of it?" asks Aukerman.

True to his scientist roots, Aukerman wanted the molecular name to sound realistic. That's why, he says, the "hypercaffium spazzinate" has "got the typical chemical suffixes — 'ium' and 'ate.'" Aukerman also insisted on featuring the chemical formula for caffeine ($C_8H_{10}N_4O_2$) on the cover. "We could have just written 'caffeine' … on the graduated cylinder," says Aukerman. "But I just thought, 'Let's give something for people to Google.'"



IMAGES COURTESY OF EPITAPH RECORDS

A science version of the iconic Milo mascot.

A stickler for scientific accuracy, Aukerman even made band artist Chris Shary, who prefers to freehand his work, make sure that the markings on the graduated cylinders and the Erlenmeyer flask were spaced apart properly on the cover. The science theme continues on the back cover, which features a miniature periodic table with each song serving as a chemical element.

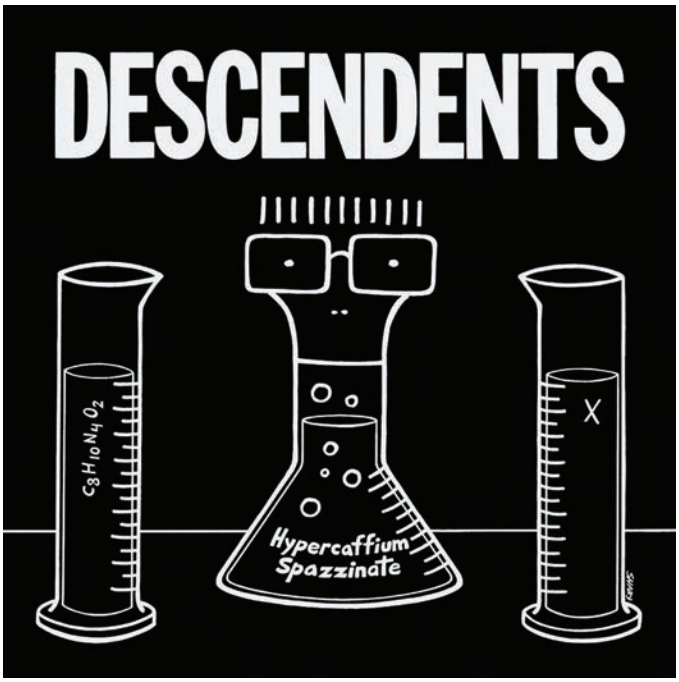
Excited by the cover art, the band's record label, Epitaph Records, asked for additional bonus content that could be included in the deluxe version of the album. Aukerman went all out. "Rather than doing it in a dry, humorless kind of way, I decided to make it into actual pages of a lab notebook," he says. "I documented a set of experiments that led to the discovery of hypercaffium spazzinate." The faux notebook also includes an email written from Aukerman to a fictional research collaborator, asking to borrow a reagent X. "Like all good science-fiction experiments, you've got to have a chemical X!" says Aukerman. "The idea is mixing these two things together, the chemical X and the caffeine, we end up with hypercaffium spazzinate."

Designing the album cover and lab notebook insert "definitely enhanced our experience with the record," says Aukerman. "It's definitely the most involvement we've ever had" with creating artwork for an album. "Music is what we usually focus on."

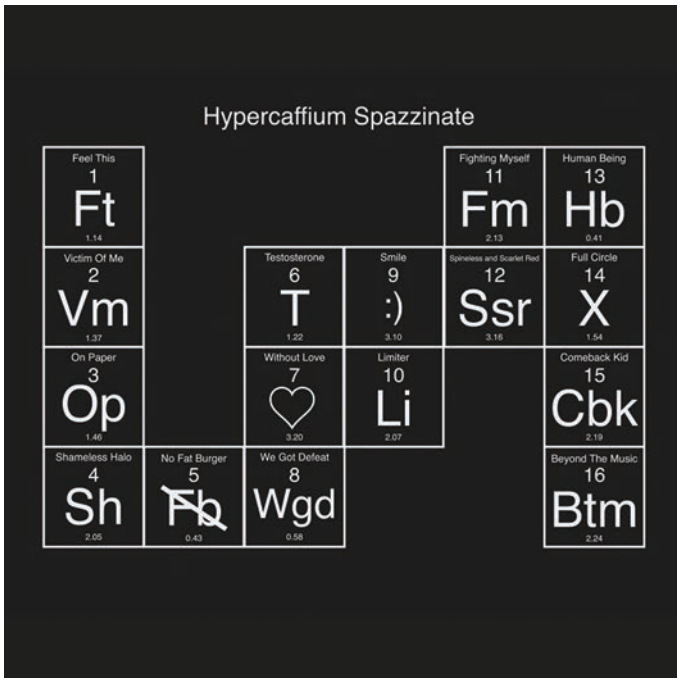
The album recording and artwork came as welcome diversions for Aukerman. In January, he was laid off from his job as a plant biochemist at DuPont, the result of downsizing due to a merger with Dow Chemical Company. "We were right in the midst of making the record at the time, so it was pretty easy for me to leave the science gig and go directly into the music-making part of my life because it was already in full swing," he says. Working on the album cover design, Aukerman says, "allowed me, on some level, to enter back into the laboratory — at least a virtual laboratory — and just have some fun in an imaginary story."

Geoff Hunt (ghunt@asbmb.org) is the public outreach manager at the ASBMB. Follow him on Twitter at twitter.com/TheGeoffHunt.

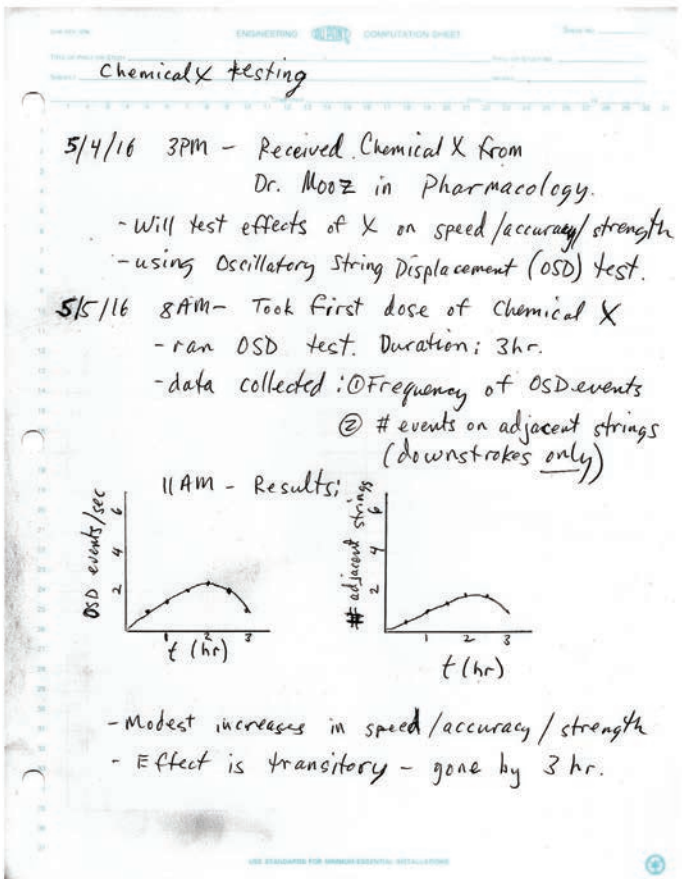
Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the managing editor for ASBMB Today. Follow her on Twitter at twitter.com/rajmukhop.

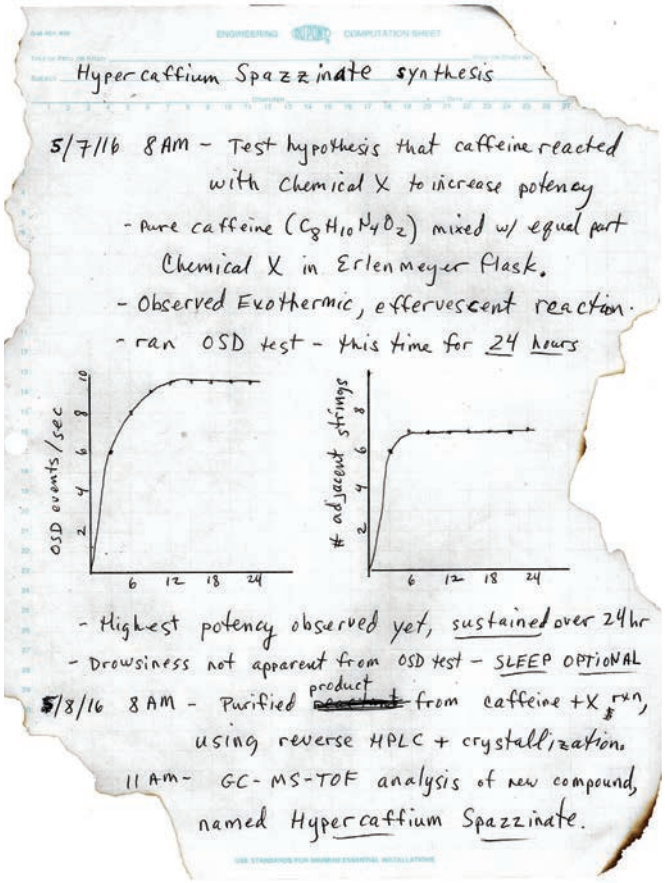


The front cover of "Hypercaffium Spazzinate" pays tribute to chemistry.

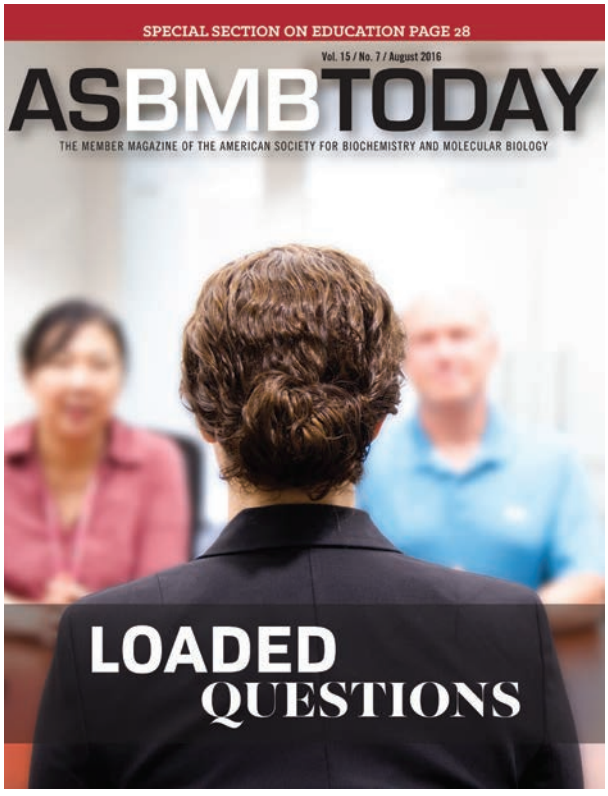


On the album's back cover, songs are listed in a periodic-table format.





The album insert is a faux lab notebook documenting Milo the mascot's synthesis and discovery of hypercaffium spazzinate.



Re: Loaded questions (August 2016)

I went on 18 interviews and was asked the things mentioned in this article in nearly all of them. At one institution, I was asked what I would do if my graduate student became pregnant. I've met two other candidates who also interviewed for the position, both men. Neither recalls being asked that question.

–Kristi Frank, Uniformed Services University

Really loved this. Especially the bit about how when an illegal question comes up you're trapped. Thanks for writing it!

–Stephen Floor, University of California, Berkeley

Re: A mother's letter to biomedical researchers (August 2016)

My prayers are that someone in ASBMB will have some knowledge on ADCY5 and/or DOCK3 (a new one to me) and they can provide much more information and hope. Will be very interested to see how Lilly and the organization progress.

–James Hazzard, University of Arizona

Dear Grossman family,
You're amazing. I do not have the too-long-unnamed disease that you have, but I can empathize with the unknown, the terror and many of the things you bravely, clearly and openly express. I just want to affirm your openness. Your sharing has helped me tonight, it has helped your daughter and it has helped 100 or more people around the world. Hopefully, it will just continue to help. I pray with you in Lilly's dreams of everything she wants to be. I don't have the words to thank you for this article, and for the long, long journey you have walked.

–Farzeen Mahmud, Philadelphia

Correction

In the August issue of the magazine, the events calendar had the details of two conferences wrong. The Society for Advancement of Hispanics/Chicanos and Native Americans in Science National Conference will be held from Oct. 13 to Oct. 15 at the Long Beach Convention Center in Long Beach, Calif. The Annual Biomedical Research Conference for Minority Students will be held between Nov. 9 and Nov. 12 in Tampa, Fla. We regret these errors and have corrected them online.

Know your liquor

A reader alerted us to a spelling error in the article "The taxi driver's book" in the June/July issue of ASBMB Today. The story, which is based in Scotland, gives a shoutout to the country's distilleries. However, our knowledgeable reader pointed out (and we later confirmed in The Associated Press Stylebook) that when liquor is distilled from grains in Canada, Japan and Scotland, it is spelled "whisky." We had it down as "whiskey." We corrected the spelling online and apologize to any Scot who may have been offended by our ignorance.