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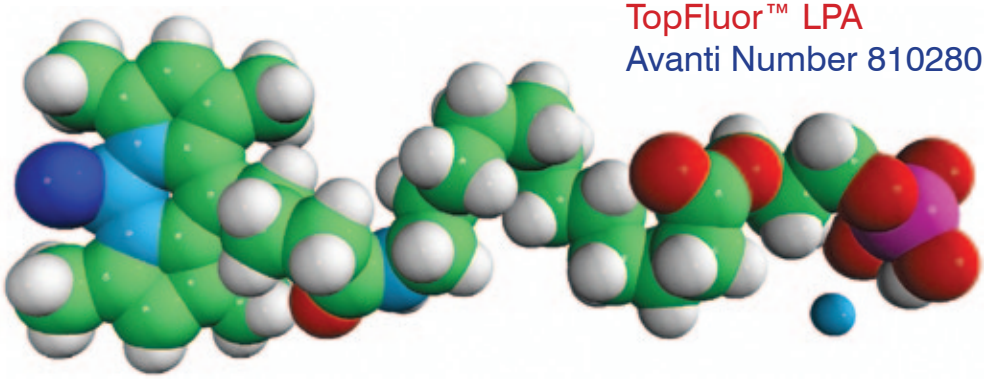

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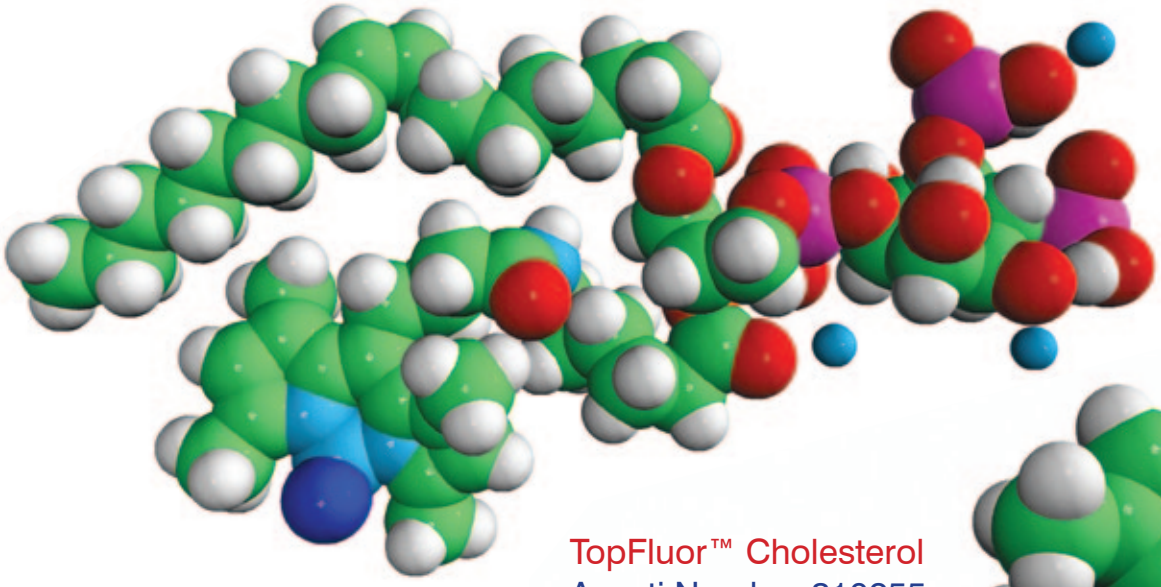

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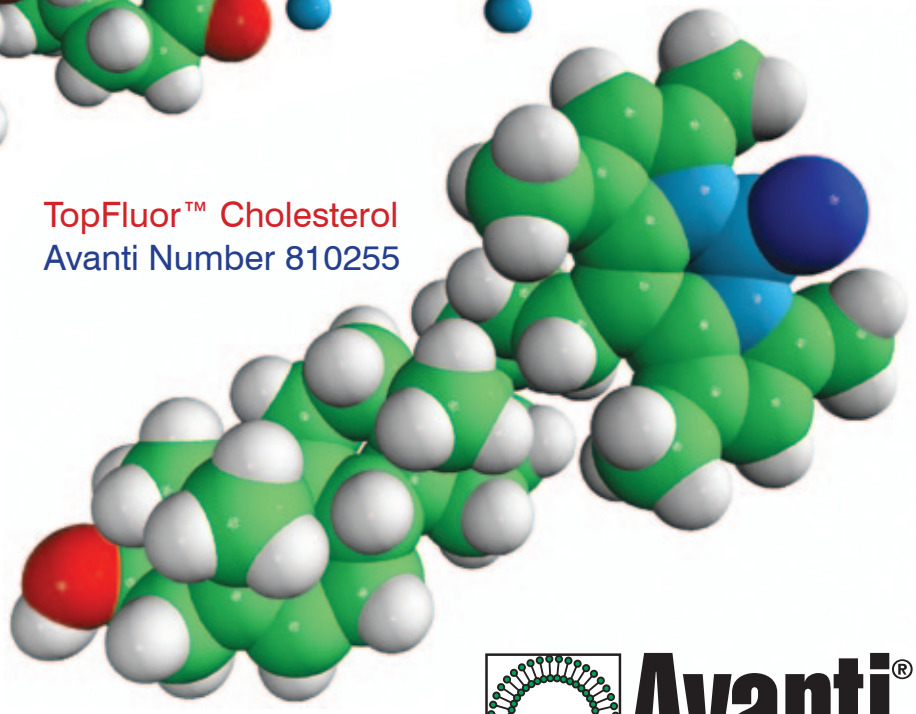

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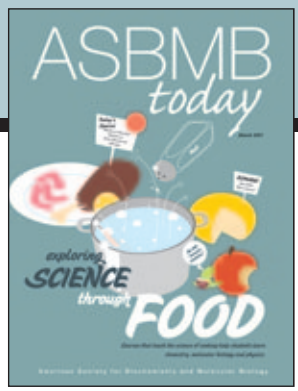

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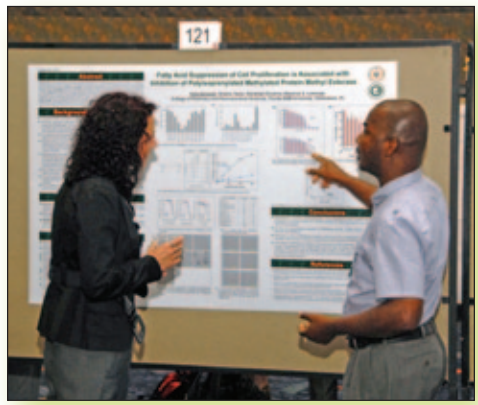

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2008 APEX® AWARDS FOR PUBLICATION EXCELLENCE

letters to the editor

Biochemistry is not tennis

Dear Editor,

A nice attempt by Suzanne Pfeffer (December issue) to relate great biochemists to great tennis players. But she forgets that, whereas great play on the court is immediately perceived as such by everyone, biochemistry is evaluated by peer review (1). Mendel never would have gotten a grant, because it took 35 years for his grand slam to be recognized. Only then was the scientific community able to "get back to the big picture" that Pfeffer thinks is so important.

Yes, certainly Pfeffer should be at her "most creative" when writing a grant, but it must be creativity in marketing, not in science. By implying that young scientists should be scientifically creative, she invites future Mendels to commit academic suicide. Rather, she should be advising them to tune in to the perceptions of the peers who will sit in judgment. Rule one is to discard ideas that they deem as scientifically the most creative. But perhaps we should not be too concerned about the loss of one or two scientific Williamses or Clijsters? After all, it's only a game!

Donald R. Forsdyke
Department of Biochemistry
Queen's University, Canada

1. Forsdyke, D. R. (2000) Tomorrow's cures today? How to reform the health research system. Harwood Academic, Amsterdam.

REPLY

Thanks, Dr. Forsdyke, for your comments and for reminding us that peer review can have its challenges. (I suppose the tennis referees get it wrong sometimes.) When I write a grant, I take time to try to identify the most important next steps that will move the science forward and the most powerful techniques that will permit me to accomplish my goals. As for marketing, all scientists have to explain why their science is important and worth funding. This is important grantsmanship, but it also is important for recruiting students and postdoctoral fellows to our laboratories and convincing legislators that science funding is critical.

Suzanne Pfeffer

Drug discovery: major challenges

BY SUZANNE PFEFFER

Last year, in the United States, more than 1.5 million new cancer cases were identified, with lung, prostate and breast cancer at the top of the list. Cancer was the cause of more than 500,000 deaths, 28 percent due to lung cancer. According to a report from the American Society of Clinical Oncology titled "Clinical Cancer Advances 2010: Annual Report on Progress Against Cancer," "Death rates dropped 1.6 percent annually from 2001 to 2006, mainly due to reductions in new cases and death rates for the three most common cancers in men (lung, prostate and colorectal cancers) and for two of the three leading cancers in women (breast and colorectal cancer)."

The report is very informative for basic scientists and clinicians alike and leaves the reader with the impression that major breakthroughs are happening every day. For example, "a randomized, phase III drug trial in patients with metastatic pancreatic cancer was the first to demonstrate a significant survival improvement in individuals with stage IV adenocarcinoma of the pancreas… treatment with FOLFIRINOX — a combination of the chemotherapy drugs 5-fluorouracil, leucovorin, irinotecan and oxaliplatin — resulted in better response rates, progression-free survival and overall survival compared to standard single-drug treatment with gemcitabine (Gemzar).

"A phase III trial found that adding the anti-angiogenesis drug bevacizumab [Avastin, Genentech/Roche] — which targets tumor blood vessel growth and development — to the standard chemotherapy drug combination carboplatin and paclitaxel helped women with advanced ovarian cancers live significantly longer without their disease progressing than chemotherapy alone."

A dramatic discovery involved a *BRAF* inhibitor for advanced melanoma: "Researchers showed that the majority of advanced melanoma patients with a specific *BRAF* gene mutation (V600E mutant *BRAF*) responded to a new *BRAF* inhibitor, PLX4032 (Roche). In the second part of a phase I trial, tumors either completely or partially regressed, including metastases in the bone and liver, in 81 percent of patients."

However, nowhere in the report did the authors mention the fact that these targeted, molecular therapies did relatively little to prolong survival. The FOLFIRINOX study reported a 6.4 versus 3.3 month progression-free survival for metastatic pancreatic cancer; women who took Avastin during standard chemotherapy for ovarian cancer lived about four months longer. And frustratingly, many of the most dramatically responsive BRAF patients relapsed within a year.

More encouraging are the data for ipilimumab, a monoclonal anti-cytotoxic T lymphocyte-associated antigen 4 antibody that Bristol Myers Squibb is testing as a treatment for metastatic melanoma and other cancers, including prostate and lung cancers. Ipilimumab blocks the inhibitory signal of CTLA-4, thereby sustaining an active immune attack on cancer cells. In a Phase III trial, about 45 percent of patients treated with ipilimumab were alive at one year compared with 25 percent of patients in the control arm. At two years, 22 to 24 percent of patients treated with ipilimumab were alive compared with 14 percent of patients in the control arm. This is the first therapy to show a survival benefit for metastatic melanoma in a randomized trial; it currently is under priority review by the U.S. Food and Drug Administration. If ipilimumab is approved for the treatment of melanoma, physicians will be at liberty to prescribe this drug off-label for the treatment of other appropriate conditions, possibly including prostate and lung cancer.

Do these data make us feel encouraged or discouraged? To be fair, these studies targeted the most aggressive cancers possible. Clearly more work is needed; the cures are not yet in hand. An added challenge is the fact that the pharmaceutical industry estimates that it costs more than $800 million to bring a single drug to market if one includes the cost of products that fail along the way (and most do). Although some have criticized this estimate as difficult to verify, no one disputes the high costs of years of drug development and animal studies followed by the clinical trials and testing required for FDA approval. For each exciting new agent, combination trials also will be needed, and one can imagine a number of combinations and additional indications that deserve further study. If only it were easier (and cheaper).

In addition to industry-funded trials, more than 25,000 patients participate in the National Cancer Institute's clinical trials annually. Following a careful review

by the Institute of Medicine, the NCI currently is working hard to improve the speed and efficiency of the design, launch and conduct of clinical trials, hoping to incorporate innovative science and trial design into cancer trials, improve prioritization, selection, support and completion of clinical trials, and incentivize the participation of patients and physicians. Given an annual clinical trial investment of more than $800 million, these goals will be important for NCI to achieve.

Beyond cancer, the goals of the National Institutes of Health Clinical and Translational Science Awards program are to speed the translation of laboratory discoveries into treatments for patients, to engage communities in clinical research efforts, and to train a new generation of clinical and translational researchers. This consortium includes 55 medical research institutions located throughout the U.S. The CTSA consortium presently is funded by the NIH National Center for Research Resources.

Recently, NIH Director Francis Collins proposed the creation of a new National Center for Advancing Translational Sciences that would oversee the CTSA program. According to available information, "NCATS is not intended to be a drug company. It is a facilitator of translational research across the NIH and complementary to translational research already being conducted and supported on a large scale in the individual NIH Institutes and Centers. NCATS will seek ways to leverage science to bring new ideas and materials to the attention of industry by demonstrating their value." In principle, it makes sense to house the CTSA program in an organizational unit that will do everything possible to facilitate drug discovery.

The creation of NCATS also has raised concerns, however, in part because it will disband the National Center for Research Resources that oversees critical, long-term technology development. NCRR supports the development of new technologies, including instrumentation, software and methods for biomedical research through a constellation of programs including Biomedical Technology Research Centers. NCRR also supports Shared Instrumentation and High-End Instrumentation Grant Programs. Currently under discussion is where to house these programs; the American Society for Biochemistry and Molecular Biology wants to be sure that they continue to be well nurtured, as they support critical, cutting-edge mass spectrometry, synchrotron X-ray technologies, molecular dynamics computation, optical and laser technology, and fluorescence spectroscopy.

All of us want cures for a long list of debilitating illnesses, and we hope that NCATS will focus on what NIH does best. Basic research is essential for disease target identification, such as BRAF in melanoma. When patients relapse, basic science also will be required to explain the molecular basis for therapeutic resistance and drug-target bypass. At the same time, the pharmaceutical industry has invested billions of dollars in drug screening and medicinal chemistry, and they are experts in drug design. It makes obvious sense to try to leverage all the expertise that industry can provide. In cancer, NCATS can encourage innovation in clinical trials and promote both industrial and industry-academic collaborations. Combination therapies are going to be essential given the recalcitrance of tumors to targeted intervention, and collaboration will be important in this regard. The U.S. Food and Drug Administration also will be an important partner as combination regimens are evaluated differently, and revisiting those guidelines may benefit all of us.

ASBMB President Suzanne Pfeffer (pfeffer@stanford.edu) is a biochemistry professor at the Stanford University School of Medicine.

Annual Meeting Special Event on Sunday, April 10:

Elizabeth Blackburn, *UCSF Nobel Laureate*, ***James McCarthy***, *Harvard University climate change expert*, and ***Michael Specter***, *New Yorker staff writer and book author*, **will discuss the implications and societal impacts of the politicization of science.** ***Richard Harris*** *of National Public Radio* will moderate the event.

Once more into the breach, dear friends

What the budget forecast holds for scientists

BY GEOFFREY HUNT

Since fiscal 2011 began on Oct. 1, federal agencies have been operating under a continuing resolution that is holding budgets at the fiscal 2010 level. However, the resolution expires on March 4, meaning Congress will have to come up with another solution to fund the government for the remaining six months of fiscal 2011. Moreover, following the release of President Obama's budget last month, the legislative branch has begun working on appropriations for fiscal 2012. Clearly, Congress would like to be finished with fiscal 2011 and get started on fiscal 2012 as soon as possible. The question is what those budgets will look like relative to past years.

In January, Republicans unveiled the Spending Reduction Act of 2011, which would reduce nondefense discretionary spending for the remainder of fiscal 2011 to fiscal 2008 levels, followed by a further reduction to fiscal 2006 levels in the succeeding fiscal years. According to their analysis, such measures would save the economy $2.5 trillion during the next decade by reducing funding to several programs, and even eliminating others like the National Endowment for the Arts and the Corporation for Public Broadcasting. In February, the House of Representatives formally acted on this proposal, voting in favor of an appropriations bill for fiscal 2011 that would reduce spending by more than $60 billion relative to fiscal 2010. The cuts target almost every federal agency, including the National Institutes of Health and the National Science Foundation. However, the Senate is not expected to endorse similar reductions and President Obama threatened to veto such a proposal, leading to a need for compromise in order to finalize the spending bill for fiscal 2011. Furthermore, following his call for investment in innovation during the State of the Union address, President Obama requested increases for the NIH and NSF budgets for fiscal 2012.

So how can science thrive in this environment? Shakespeare's Henry V inspired his outnumbered troops to "Stiffen the sinews, summon up the blood." Science advocates and researchers will need to be equally truculent as they continue to spread the message about the importance and benefits of science to society.

Funding for scientific research does more than support experiments on lab benches across the country; it also spurs innovation, leading to technological developments and job creation; expands American global influence and competitiveness; and improves public health. Health care costs are predicted to double as a percentage of gross domestic product by 2050. Rather than attempt to pay for these unmanageable costs as they continue to escalate, the government should focus instead on investing in biomedical research so that scientists can develop preventative therapies and treatments. This is more than good health policy; it also is good economic policy. Lowering health care costs will reduce Medicare and Medicaid budgets, lessening the strain on our economy and shrinking the national debt.

Investing in research also will have a more immediate economic impact. Health-related services based in America added $2.8 trillion to the global economy in 2007, helping the United States maintain its position as a world economic leader. Furthermore, federal support of science spurs job creation and sustained employment. Studies estimate that every NIH R01 grant supports three employees, while training grants like K awards help maintain the scientific pipeline. By supporting graduate student education, NIH grants also prepare the next generation of innovators. Lacking this support, students increasingly will turn away from careers in science, depressing innovation and weakening American global influence.

The American Society for Biochemistry and Molecular Biology has signed on to numerous letters sent to congressional leadership enumerating these points, calling for increases in NIH and NSF budgets. March will see ASBMB members return to Capitol Hill, carrying a defined agenda to present to Congress in person. By continuing to stress the benefits of investment in research, scientists can, like the English at the Battle of Agincourt, prevail when the situation looks its gloomiest. XXX

Geoffrey Hunt (ghunt@asbmb.org) is the ASBMB science policy fellow.

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ASBMB-FRITZ LIPMANN LECTURESHIP

Arthur E. Johnson to give award talk

Texas A&M professor recognized for methods used to understand complex molecular machines

BY ANGELA HOPP

Arthur E. Johnson, a distinguished professor at the Texas A&M Health Science Center's College of Medicine, has been chosen to give the Fritz Lipmann Lectureship at the American Society for Biochemistry and Molecular Biology annual meeting in April in Washington, D.C.

"Art revolutionized our understanding of how complex protein machines operate," says Vytas A. Bankaitis of the University of North Carolina at Chapel Hill School of Medicine, who nominated Johnson for the award. "The level of international acclaim and respect afforded to him by the larger scientific community is richly deserved on the basis of his outstanding research accomplishments over a distinguished career."

The lectureship, which is awarded every two years, recognizes investigators who make conceptual advances in biochemistry, bioenergetics and molecular biology. Johnson was named the winner for pioneering the use of site-specific incorporation of non-natural amino acids into polypeptides and biophysical fluorescence approaches toward detailed elucidation of the dynamics and functional mechanisms of complex molecular machines.

After completing his undergraduate studies in chemistry at the California Institute of Technology in the 1960s, Johnson taught and coached football in Boston. He then went on to earn his doctorate in chemistry at the University of Oregon in 1973 and conduct postdoctoral work at Columbia University.

Thereafter, he joined the faculties of the University of Oklahoma in 1977 and Texas A&M University in 1994. Today, he holds the E. L. Wehner-Welch Foundation chair in chemistry at the College of Medicine.

To this day, Bankaitis says, the approaches Johnson pioneered remain the most powerful, yet accessible, tools to study the dynamics of complex biochemical systems. Additionally, he says, Johnson always has been "a gentleman scientist."

"I thank ASBMB and the students, postdocs and collaborators who made this possible. Since Dr. Lipmann discovered EF-Tu, the focus of much of my early research, being named the Lipmann lecturer has extra significance for me." **ARTHUR E. JOHNSON**

"These days, it is all too common for researchers to be driven to prolific productivity by the motive of enterprise — the desire to be recognized, to win awards, to establish themselves personally," he emphasizes. "While all of these motives are legitimate in proper measure, what is often lost is the proportion between mentorship and enterprise, between noble scientific pursuit and competition for the more material rewards, between a genuine desire to foster the independent careers of young researchers and exploitation of those talents.

"Art Johnson has always been a consummate professional — a great scientist, an effective and engaged mentor, a dedicated and effective teacher, and an outstanding citizen with respect to professional service."

Angela Hopp (ahopp@asbmb.org) is managing editor for special projects at ASBMB.

About the award

The Fritz Lipmann Lectureship was established by friends and colleagues of Nobel laureate Fritz Lipmann and is awarded every other year for conceptual advances in biochemistry, bioenergetics or molecular biology. The award provides a plaque, a $3,000 purse, and transportation and expenses to the ASBMB annual meeting to present a lecture. Johnson will give his talk, "Membrane Protein Biogenesis," at 9:03 a.m. April 11.

asbmb member update


HOOD


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JENTSCH


SCHREIBER

Hood awarded bioengineering's Russ Prize

Leroy Hood, president and co-founder of the Institute for Systems Biology, has been awarded the bioengineering profession's highest honor, the Fritz J. and Dolores H. Russ Prize. The prize, given by Ohio University and the National Academy of Engineering, was presented to Hood for his discoveries related to the sequencing of the human genome.

"Dr. Hood's contribution has advanced health and quality of life in the U.S. and around the world, and have enhanced the education of future engineering leaders," said NAE president Charles Vest in a news release. "Recognizing him not only rewards great accomplishments but also shines a light on the importance of work that may inspire others to build on their achievements."

Hood developed the automated DNA sequencer, which enables the rapid, automated sequencing of DNA, making a significant contribution to the mapping of the human genome and revolutionizing the field of genomics. To date, more than 1,000 genomes have been revealed using the automated DNA sequencer, transforming many areas of biology and accelerating the pace of scientific discovery in ways that will profoundly impact research in the coming decades.

The advancement also has led to expressed sequence tagging, which ultimately helped to predict gene function, and the ability to identify genes involved in diseases.

The Russ Prize was established in 1999 at the request of Ohio University to honor alumnus and esteemed engineer Fritz Russ and his wife, Dolores. Their multimillion dollar gift to the university for the prize was intended to promote engineering education and bioengineering achievements that are in widespread use and have improved the human condition worldwide. Hood is the sixth recipient of the biennial prize, which is modeled after the Nobel Prize.

Barbas wins NIH Pioneer Award

Carlos F. Barbas III, the Janet and Keith Kellogg II chair in molecular biology at the Scripps Research Institute, is among the recipients of the 2010 National Institutes of Health Director's Pioneer Awards. The awards, given to exceptionally creative scientists who take innovative approaches to major challenges in biomedical research, provide up to $500,000 in research funding for five years.

Barbas' project will focus on chemically programming immunity, which could lead to pills that instantaneously program both adaptive and innate arms of the immune system to attack a tumor or virus, preventing infection and halting disease. His goal is to develop novel approaches that allow innate and acquired immunity to be targeted purposefully to pathogens of interest. Ultimately, the studies will allow scientists to program a variety of immune cells and responses to attack pathogens of interest using a variety of mechanisms. He also intends to explore novel approaches that should allow for circulating immunoglobulins induced with covalent vaccines to be programmed to inhibit HIV-1 and flu virus entry. The vaccines that result from these studies may be of both prophylactic and therapeutic utility.

Burgers named Marvin A. Brennecke professor of biological chemistry

Peter M. J. Burgers has been named the Marvin A. Brennecke professor of biological chemistry at Washington University School of Medicine in St. Louis. The professorship will provide continuous funding for Burgers' research, which focuses on DNA replication and repair.

The professorship is named for Marvin A. Brennecke, a 1930 graduate of the school of medicine. Brennecke spent the bulk of his career in Hawaii, where he served as the Territory of Hawaii government physician for the Koloa District and later as medical director of Waimea Hospital in Waimea, Kauai. Brennecke died in 1994, leaving a gift to the university that provides ongoing funding for three named professorships. In addition to Burgers' appointment, the gift supports the Brennecke professor of molecular microbiology and the Brennecke professor of biophysics.

Burgers studies DNA metabolism in yeast cells. He is particularly interested in the DNA replication fork and the mechanisms that come into play when replication goes awry because of DNA damage or other stress.

Jentsch receives Louis-Jeantet Prize for Medicine

Stefan Jentsch, director of the department of molecular cell biology at the Max Planck Institute of Biochemistry in Germany, has been selected to receive the 2011 Louis-Jeantet Prize for Medicine.

Jentsch received the award for his

work on small protein modifiers and their role in DNA repair. He pioneered studies on protein modifications by ubiquitin and related proteins. Modification of proteins by ubiquitin usually targets the proteins for degradation. However, Jentsch's research revealed that ubiquitin also plays a crucial role in genome maintenance and DNA repair. This research has significant medical importance, as damaged DNA can cause various diseases, notably cancer.

The Louis-Jeantet Foundation grants 700,000 Swiss Francs for each of the 2011 prizes, 600,000 of which are for the continuation of the prize-winners' work and 100,000 for their personal use. The prizes are given to cutting-edge researchers who are active in the European Council member countries. Established in 1986, the Louis-Jeantet Prize for Medicine thus far has been awarded to 73 researchers: 23 in the United Kingdom, 14 in Switzerland, 12 in France, 11 in Germany, three in the Netherlands, three in Sweden, two in Belgium, two in Finland, two in Norway and one in Austria.

Schreiber receives chemical biology lectureship

Stuart L. Schreiber, the Morris Loeb professor in the department of chemistry and chemical biology at Harvard University and founding member of the Broad Institute of Massachusetts Institute of Technology and Harvard University, has been awarded the American Chemical Society's Chemical Biology Lectureship in recognition of his pioneering contributions to research at the interface of chemistry and biology.

Schreiber and his colleagues pioneered the concept of diversity-oriented synthesis and chemical genetics to discover new drug targets and to elucidate new biological pathways, including the fundamental biological importance of histone deacetylation. His current work deals with exploiting new insights into cancer cell genomes to develop novel therapeutic agents by correlating drug efficacies with the genetic features of human cancers.

KORNFELD

ROTHMAN

SCHEKMAN

Three ASBMB members split Wilson Award

Stuart Kornfeld, James E. Rothman and Randy W. Schekman were awarded the E. B. Wilson Medal, the American Society for Cell Biology's highest honor, for their pioneering research on protein transport.

Kornfeld, co-director of the Division of Hematology at the Washington University School of Medicine, was noted by the selection committee as having been at the forefront of research in glycobiology, protein trafficking and metabolic disorders throughout a career spanning more than four decades.

The Selection Committee also recognized Rothman and Schekman as pioneers in the understanding of the molecular basis of protein transport through the secretory pathway and as internationally renowned leaders in cell biology. Rothman is chairman of the department of cell biology at the Yale University School of Medicine and Schekman is a Howard Hughes Medical Institute investigator as well as professor of cell and developmental biology at the University of California, Berkeley.

IN MEMORIAM:

James R. Mattoon

James R. (Jim) Mattoon of Loveland, Colo., passed away Dec. 24. He was 80.

Mattoon was born in 1930 in Loveland. He attended Colorado Agricultural and Mechanical College (now Colorado State University) and graduated from the University of Illinois in 1953. Mattoon received his Master of Science and doctorate in biochemistry degrees from the University of Wisconsin and taught at the University of Nebraska and the Johns Hopkins Medical School. He moved to Colorado Springs in 1979 to teach at the University of Colorado, where he remained until he retired.

Mattoon lived in both Mexico City and Rio de Janeiro, where he did further research and taught. He lectured in many places in the world, often in the local language, and supervised many foreign graduate and postdoctoral students. At the time of his retirement, Mattoon was teaching in the microbiology and genetics department of CU, Colorado Springs. He also was an accomplished pianist and tenor soloist in his younger years.

ASBMB roundtable: Carol Greider

Nobel laureate Carol Greider talks about life after receiving the Nobel prize

BY NICK ZAGORSKI

Carol Greider, the Daniel Nathans Professor of molecular biology and genetics at Johns Hopkins University, has no shortage of work on her desk. Along with all her normal laboratory, teaching and departmental duties, Greider is hard at work finishing up four separate research papers while thinking ahead to her next round of grant submissions. It's a hectic schedule that one might think would induce stress, but for Greider it's actually a welcome relief.

"What this means," she says in reference to the clutter of papers around her, "is that my life is slowly settling back to normal."

It was a little over a year ago when Greider's routine normalcy experienced a major shake-up with the news that she had won a share of the 2009 Nobel Prize in medicine for her work in discovering the enzyme telomerase. It was not an entirely unforeseen event (Greider also had received a Lasker award in 2006, a good barometer for future Nobel success), but it still did not prepare Greider for all the pageantry that was to follow.

While most of us may be familiar with the media blitz that coincides with the yearly Nobel award announcements, that first week was just the start of a whirlwind series of months for Greider, which included trips to Sweden and the White House and more interview and public speaking requests than one could shake a day planner at.

Although life may never quite be the same as it was pre-Nobel, the start of 2011 at least has proven to be relatively quiet, allowing Greider to focus more on her passion: good basic science. And with that little extra downtime, Greider had the opportunity to sit down with the American Society for Biochemistry and Molecular Biology and explain what the laureate life is like, one year later.

ASBMB: ***Your schedule was undoubtedly hectic following the initial award announcement; was there a specific moment during that whole event when the fact you had just won science's most prestigious honor actually sank in?***

GREIDER: Oh, I think that moment is still coming up; I still can't quite believe it.

ASBMB: ***At the same time, though, part of you must have known it could happen someday, given some of the other recent accolades you have been collecting, like the Lasker award and your induction into the National Academy of Sciences.***

GREIDER: True, the award wasn't a complete and total surprise, but at the same time I think it's important to note that I didn't get into scientific research for the prizes. I gave a lecture recently, and one of the questions I heard was, "Now that you've achieved the highest goal in science, what's next?" And my answer was that wasn't my ultimate goal. What I want to do is help fully elucidate the biological role of telomerase, and we still have a ways to go.

ASBMB: ***And what specific areas are the target of telomerase research today, whether projects in your lab or elsewhere?***

GREIDER: Well, the great thing about telomerase is that there are surprises in store at every level, from the molecular details to studies of human disease. Biochemically, a big puzzle is understanding how telomerase specifically elongates the shortest telomere, and we're making some inroads into that. On a broader level, we're just beginning to appreciate the degree to which telomerase mutations are associated with many different human diseases.

ASBMB: ***What was the most difficult aspect of being a Nobel winner? Was there ever a point during the whole process where you may have thought, "Maybe I would have been better off if I didn't win?"***

GREIDER: Well, besides having to write my own autobiography, the hardest part might have been keeping track of all the requests for interviews or speaking engagements I received shortly after getting the award. At the peak I think I was averaging almost 100 requests a week, and I definitely needed help in managing my phone calls and e-mails. It's always been

a positive experience though; the only negative aspect has been turning down invitations because of lack of time.

ASBMB: ***And among the numerous media requests you received, was there any particular one you remember for being unusual or unexpected.***

GREIDER: Well, in some of my first interviews I had mentioned that I have dyslexia and how I coped with it growing up, and soon afterward I got contacted by several dyslexia associations and ended up doing many interviews and video shoots for them, becoming sort of a spokesperson. And that was unexpected because I had no idea the dyslexia community was so organized and active, but I'm glad I had a chance to work with them, because it was a learning experience for me as well.

ASBMB: ***And speaking of experiences, how was your trip to Stockholm to receive your award?***

GREIDER: That was a wonderful experience, though quite busy as well, and I'm grateful that the Nobel committee provided an attaché to help manage my schedule for the days I was there; I also made sure to ask [2003 Hopkins laureate] Peter Agre and his wife what to prepare for. It was especially memorable because I had the opportunity to invite friends and family from around the world to share in the ceremonies with me.

ASBMB: ***Are there any particular moments from that trip that stand out for you?***

GREIDER: I don't think there was anything really newsworthy, though one interesting moment occurred right on the day of the awards banquet; I decided to go ice skating with my two kids, and everyone around me was getting all nervous, and saying, "What are you going to do if you fall and break your leg?"

ASBMB: ***And you also had an opportunity to meet President Obama, a fellow 2009 Nobel laureate?***

GREIDER: That's right, though the Peace prize is given out in Oslo so Obama was not at the Stockholm ceremony. However, the White House did have a Nobel reception before the awards, and I got to attend with my kids, and we all got our pictures taken in the Oval Office, so we had a great time.

ASBMB: ***On that note, I guess a good, and important, question to finish with is, Where is your medal displayed?***

GREIDER: The official Nobel medal is actually solid gold and a lot heavier than you might think, so for the time being I have that in a safe deposit box until I figure out what to do with it. I did get several replica medals, though, and I do have one of those displayed.

Nick Zagorski (nzagorski@asbmb.org) is a freelance science writer.

The ABCs of poster making

Whether you're attending the ASBMB annual meeting in April or making a poster for a departmental retreat, you're sure to find these tips useful

BY MARINA PAZIN

As scientists, we spend much of our time formulating hypotheses about questions that haven't yet been answered, designing and conducting experiments to test if our initial predictions about the outcome are accurate, and then again developing new educated guesses based on accomplished work. Yet this work hardly ever is done alone. Underlying all the work a researcher conducts is a constant stream of communication. To formulate the original hypothesis and to determine what needs to be addressed, we read journal articles. While designing and conducting experiments, we seek feedback from lab members and collaborators. When adequate data has been collected, we proudly present it at symposia and conferences as posters and talks and, finally, in print.

Even though it may seem simple, putting together an effective poster and delivering its content to your audience is no easy feat. Everything from the poster's layout to the font size and colors you use to represent your data must be carefully thought out. Although a variety of software can be used to make posters, generally PowerPoint is used because it is both Mac and PC friendly, and most researchers are familiar with it, making the work of summarizing results on a poster just that much easier.

Although you will find many different poster layouts at a conference, generally they all conform to the following basic format. They have a title, centered on the poster, which, in a single sentence, serves to summarize the findings. Though sometimes it appears in ALL CAPS or Title Case, the title is more legible when written as any other sentence, with only the first letter capitalized. To make the title stand out from the remaining content on your poster, enhance the size, set the font to bold and consider using a different color from the body text. Below the title are the author names and affiliations. These too are centered across the upper panel of the poster.

The left column: introduction and methods

Below the title, author and affiliation headings, the content of a standard scientific poster generally is laid out in three-column format. The column on the left generally contains the introduction, which recaps the background information about your project. Better presented in bullet format rather than a single paragraph, the introduction summarizes relevant previous findings (whether by your research team or others) as well as the questions raised by these findings that you ultimately addressed. If at all possible, it is best to present this information as a diagram to make it easier for the reader to grasp the significance of your work as quickly as possible. (Remember that depending on the conference, there may be hundreds of posters on different topics displayed at any given time, so you want to do everything within your power to help your readers understand the significance of your work in an efficient manner.)

Although usually your project's abstract appears in the meeting guide, some organizers require a copy of the abstract also to appear on the poster. In this case, the abstract section of the poster replaces the introduction.

The left column also should clearly state (preferably in a single sentence) the hypothesis underlying your work and describe, under a Materials and Methods section, how the hypothesis was tested. Avoid being too wordy and again, especially if new technology is being used to address the question, try to include a graphic.

The center column: figures

The central panel of the poster generally displays figures representing the findings of your work and the corresponding figure legends. Several things should be kept in mind when putting this section of the presentation together. First, although it is good to be creative and color readily draws the attention of the reader, be careful when selecting colors to represent your data (e.g., on a chart or in a graph). It is estimated that in the U.S., nearly 8 percent of men and nearly 0.5 percent of women are color blind. Therefore, it is better to use different symbols, all in black, to distinguish among different groups on a graph rather than using different colors. If you are tempted to use color, however, avoid using red, green, blue and yellow.

If you show the same data (i.e., treatment type) on multiple graphs or charts, keep its representation (symbol and/or color) consistent from one figure to the next. Again, this serves to help your reader understand your findings in the least time-consuming manner.

The legends below each figure should summarize the finding depicted by the figure in a single sentence and explain, if appropriate, whether statistical significance between the various groups compared has been attained. Although you may be tempted to present all of your work on the poster, include only the work most relevant to the title of the poster. You can discuss your other findings with your audience in person if they are interested in learning more about your research.

The right column: conclusion

The last column is used to summarize the findings of the presented work under a Conclusion heading and to address its significance and any future work you may conduct based on the questions you already have addressed. Remember also to thank everyone who helped you under the Acknowledgment heading. This also is the place to include information about the agency funding your work and to whom the funding was issued.

Remember that a poster should speak clearly and concisely about your work, so it likely will take several attempts and drafts for you to design a poster that does it right. However, seeing audiences engrossed by your work at a conference should serve as a reminder that the effort you put into your poster is well worth the satisfaction you'll feel as a reward.

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Why is evolution so hard to understand?

Realizing that function and biological meaning can arise from random processes may help people understand and accept evolution

BY MIKE KLYMKOWSKY

It is well known that evolutionary theory is not accepted by large segments of the American public, including teachers (1). Numerous surveys routinely place us at the bottom of the developed countries in this regard. This often provokes something akin, ironically, to a biblical wailing and gnashing of teeth among segments of the science and education communities. Yet I would argue that the problem is both more serious and more hopeful than it appears.

A serious problem

Why is it more serious? Because it is clear that in many cases, the acceptance of evolution is not based on a real understanding of evolutionary mechanisms. As pointed out by Gregory (2), "natural selection is generally very poorly understood, even among many individuals with postsecondary biological education." For example, about 38 percent of people responding in a recent Gallup poll said that the statement, "Humans evolved, with God guiding," comes closest to their views on the origin and development of human beings (Figure 1). My own research indicates that many molecular biology students do not understand the molecular-level mechanisms behind genetic variation and DNA behavior (3). Similarly, students have difficulties imagining that molecular-level, stochastic events can produce directed macroscopic behaviors like diffusion or evolutionary change (4).

This failure of imagination has its roots in human behavior: We are programmed, it seems, to find or project meaning onto almost everything, from finding significance in the deaths of children due to sickness and natural disasters to interpreting the vagaries of fate as reward or punishment for past behavior. Our social nature leads us to read meaning into others' expressions, tone of voice and behavior. The idea that organic things are good and artificial things are bad is commonly are assumed to be valid, but it ignores the dangers of natural toxins, among other things, and minimizes the value of technological innovations like fertilizers, genetically modified organisms, antibiotics and vaccines (5).

A hopeful solution

So why would I make the claim that the situation is hopeful? Because, while the random drivers active in biological systems and upon which evolution depends are difficult to

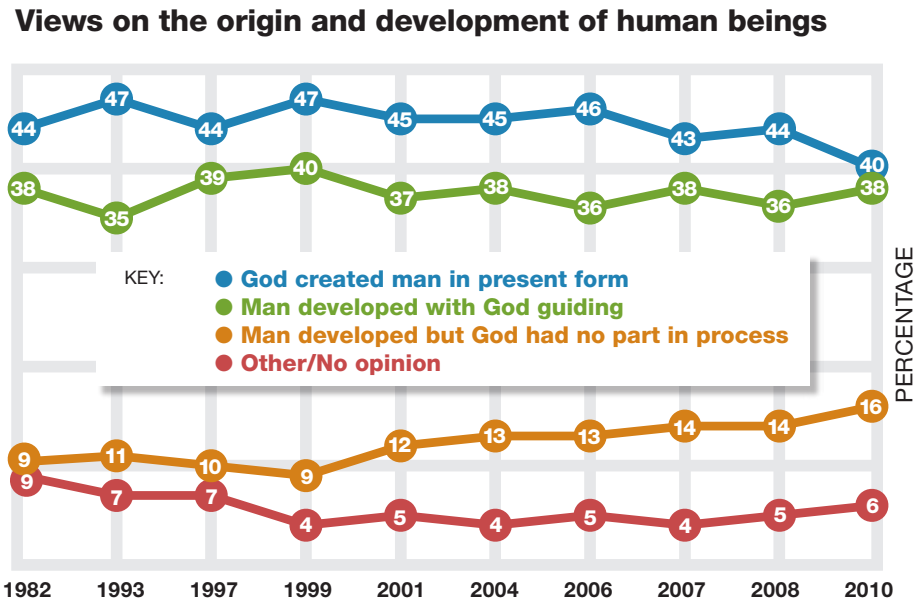

Figure 1. Results of a 2010 Gallup poll in which participants were asked which statement comes closest to their views on the origin and development of human beings.

grasp or credit, it also is the case that our current education system rarely, if ever, attempts to teach them in a serious and effective manner. So the question is, what would happen if the educational system actually addressed these issues head on? What if biology was taught in a way that stressed the fact that the molecular level processes that underlie evolutionary events are difficult to understand? Why not teach that the second law of thermodynamics drives the appearance of ordered structures even as the universe as a whole descends into chaos? Or that DNA is not particularly stable but is actively repaired and that its instability is necessary for evolution (and responsible for disease)? Or that molecular-level genomic dynamics (mutations, DNA duplication and rearrangements) occur with remarkable frequency and underlie the appearance of new traits and new species?

Would it help if students understood that molecular affinities are a function of binding energies and thermal perturbations rather than common lock and key depictions or that off-target interactions with physiological significance are not uncommon and are, in fact, responsible for a number of the side effects of drugs and, for that matter, make drugs without side effects essentially impossible? Or that off-target interactions, together with gene duplications and rearrangements, underlie the generation of new functions? Or that molecular promiscuity arises from the fundamental nature of intermolecular interactions and is used again and again to generate new functions and phenotypes (6 – 8)?

What if animations, such as the spectacular "Inner Life of the Cell" video, presented stochastic realities and eschewed scenes in which molecules appear to know where they are going? Would it help student understanding if depictions of polypeptide synthesis, for example, consistently illustrated the fact that during translation, the ribosome-mRNA complex must reject a substantial number of uncharged and charged but inappropriate aminoacyl-tRNAs before random motion brings the correct aminoacyl-tRNA to the active site? Or that transcription factors use their nonspecific, low-affinity binding to DNA to facilitate interactions with their high-affinity targets via one-dimensional diffusion? Or that regulatory noise plays a key role in how biological systems, from operons to neural networks, work? After all, the lac operon would not function if it were not leaky!

Could the fact that mutations only come in a limited number of generic types (9) and often have relatively mild effects be used to explain how drift and genetic noise can lead to evolutionary innovation in response to selective pressures (10)? In that light, would the inherent instability of DNA (11, 12) and genome dynamics, as illustrated by the prevalence of somatic mutations and copy number variation (13 – 15), make evolution in general, and the origin and evolution of cancer and other diseases in particular, more comprehensible? What if students understood that even simple systems of gene interactions can produce complex and surprising behaviors (16 – 18)?

In each case, the goal of presenting these biological scenarios would be to establish and reinforce the multiple ways that function and biological meaning can arise out of random processes. The goal is to address directly what makes the naturalistic, evolutionary explanation of life possible yet difficult to accept. Of course, the educational approach to helping students understand evolution depends on accessible and well-designed course materials and a commitment to universal learning rather than the sorting of students. Learning how evolution works will require that we provide students with the time and feedback needed to come to accept what are, on their face, implausible ideas.

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REFERENCES

1. Berkman, M.B. and E. Plutzer. (2010). Defeating creationism in the courtroom, but not in the classroom. *Science* **331**, 404–405.
2. Gregory, T. R. (2009). Understanding natural selection: essential concepts and common misconceptions. *Evo. Edu. Outreach* **2**, 156–175.
3. Klymkowsky, M. W., Underwood, S. M., and Garvin-Doxas, K. (2010). The Biological Concepts Instrument (BCI), a diagnostic tool to reveal student thinking.
4. Garvin-Doxas, K., and Klymkowsky, M. W. (2008). Understanding randomness and its impact on student learning: lessons from the Biology Concept Inventory (BCI). *Life Science Education* **7**, 227–233.
5. Ridley, M. (2010). The rational optimist. New York: Harper.
6. Copley, S. D. (2003). Enzymes with extra talents: moonlighting functions and catalytic promiscuity. *Curr. Opin. Chem. Biol.* **7**, 265–272.
7. Khersonsky, O., and Tawfik, D. S. (2010). Enzyme promiscuity: a mechanistic and evolutionary perspective. *Annu. Rev. Biochem.* **79**, 471 – 505.
8. Kim, J., Kershner, J. P., Novikov, Y., Shoemaker, R. K., and Copley, S. D. (2010). Three serendipitous pathways in E. coli can bypass a block in pyridoxal-5'-phosphate synthesis. *Mol. Syst. Biol.* **6**, 436.
9. Muller, H. J. (1932). Further studies on the nature and causes of gene mutations. *Sixth Int. Cong. Genet.* **1**, 213–255.
10. Blount, Z. D., Borland, C. Z., and Lenski, R. E. (2008). Historical contingency and the evolution of a key innovation in an experimental population of Escherichia coli. *Proc. Natl. Acad. Sci. U.S.A.* **105**, 7899–7906.
11. Amosova, O., Coulter, R., and Fresco, J. R. (2006). Self-catalyzed site-specific depurination of guanine residues within gene sequences. *Proc. Natl. Acad. Sci. U.S.A.* **103**, 4392–4397.
12. Lindahl, T., and Nyberg, B. (1972). Rate of depurination of native deoxyribonucleic acid. *Biochemistry* **11**, 3610–3618.
13. Marques-Bonet, T., et al, (2009). A burst of segmental duplications in the genome of the African great ape ancestor. *Nature* **457**, 877–881.
14. Schrider, D. R., and Hahn, M. W. (2010). Gene copy-number polymorphism in nature. *Proc. Biol. Sci.* **277**, 3213–3221.
15. Stankiewicz, P., and Lupski, J. R. (2010). Structural variation in the human genome and its role in disease. *Annu. Rev. Med.* **61**, 437–455.
16. Atkinson, M. R., Savageau, M. A., Myers, J. T., and Ninfa, A. J. (2003). Development of genetic circuitry exhibiting toggle switch or oscillatory behavior in Escherichia coli. *Cell* **113**, 597–607.
17. Chang, D. E., Leung, S., Atkinson, M. R., Reifler, A., Forger, D., and Ninfa, A. J. (2010). Building biological memory by linking positive feedback loops. *Proc. Natl. Acad. Sci. U.S.A.* **107**, 175–180.
18. Elowitz, M. B., and Leibler, S. (2000). A synthetic oscillatory network of transcriptional regulators. *Nature* **403**, 335–338.

Exploring science through food

Courses that explore the science of cooking help students learn chemistry, molecular biology and physics

BY JOSEPH PROVOST

Using food and cooking to teach science to a wider audience is a growing trend. Since the Food Network is becoming more popular with the 18- to 34-year-old demographic (the network draws 44 million viewers to its cable shows, and its website posts 12.8 million unique visitors in a month), there is a ready-made audience for science education in the context of food. For those unfamiliar with the topic, the science of cooking is not about nutrition or food safety. Rather, it falls under the discipline of molecular gastronomy, a scientific approach to cooking pioneered by French physical chemist Hervé This and Hungarian physicist Nicholas Kurti. A science of cooking course can be very chemistry oriented or multidisciplinary in nature.

A smorgasbord of courses

There are many successful examples of courses that utilize the science of cooking to teach students chemistry, molecular biology and physics. One of the first courses to combine food and science was taught at the Massachusetts Institute of Technology called Kitchen Chemistry. The class, created by Patti Christie, was taught in a small seminar format and combined hands-on cooking with current scientific literature. In a similar course taught at Harvard University, top chefs are brought into the classroom to present molecular cooking to undergraduates. The course teaches about gel foams and the molecular nature of haute cuisine. Marcia France at Washington and Lee University teaches a course that covers science basics in lecture and takes students on field trips to restaurants and vineyards. Brenda Kelly and Brandy Russell at Gustavus Adolphus College teach a four-week course that involves laboratory experiments and covers a wide range of materials from oxidation of food to food color and fermentation. While many of these courses incorporate laboratories into their pedagogical approach, Deon Miles and Jennifer Bachman at Sewanee had a good experience teaching the science of cooking in a lecture-only format.

Joseph Provost teaches a liberal studies course at Minnesota State University Moorhead called The Science of Cooking.

The missing offering

What's missing in this spectrum of courses is one designed for nonscience majors with an inquiry and lab or lab-like experience. To fill this need, I created a liberal studies course at Minnesota State University Moorhead called "The Science of Cooking." The class is taught to a large, mixed-major audience of up to 150 students per semester and incorporates 12 hours of laboratory experience. The lab portion of the course is designed to be conducted either within the lecture hall or at home, negating the demand for separate laboratory sections to meet the large class size.

The general format of my class is to start with a particular food or cooking technique and to cover all the scientific topics needed to understand the molecular nature of that food or technique. For example, under the topic of hot sauces, students are introduced to botany, evolution, chemistry and neurochemistry, all while learning how to make a fantastic pineapple-mango salsa. The Science of Cooking starts with an introduction to the basic biochemistry and molecular biology of food and covers a range of topics from milk and cheese to meat, chocolate, breads and beer. The course makes heavy use of video clips from Alton Brown's "Good Eats" to emphasize the application of science for each topic discussed.

The laboratory portion of the course involves frequent in-class experiments and taste testing. One example is freezing point depression and ice cream making. Students work in groups using various salt solutions to measure freezing point depressions, create secondary plots to determine trends and analyze the impact of salt and sucrose on making ice cream. Other in-class experiments include using convection, microwave and induction cooking to explore the physics behind heat transfer. Because of the large class size, students also are expected to work on experiments at home. One of these is an inexpensive and safe experiment in which students make mozzarella cheese with and without a calf or goat lipase. Students must examine the nature of cheese making at the molecular level and predict and describe what is happening to the chemical make-up of the cheese when lipase is included in the recipe. Another in-home experiment focuses on the enzymatic activity of tyrosinase and its impact on the browning of fruit. All of these experiments provide a fun and tasty way to engage students.

The Science of Cooking class closes with a two-day, science-based meal where the science behind the food and the recipes are provided and the class cooks and eats its final project. Lemon Pan Sauce Chicken provides a chance to understand some of the maillard reaction, marinated shrimp allows us to talk about acid denaturation of meat and the impact of free amino acids on taste, biscuits are used to discuss chemical leavening agents and cheese soufflé is a great way to examine both protein denaturation and gas laws.

Teaching materials for this course can be a particular challenge. There are several interesting books that incorporate science and cooking, but few of them are written to be used explicitly as textbooks. In my class, we use Harold McGee's "On Food and Cooking: The Science and Lore of the Kitchen." This is a great book and is well received by the students. Supplementary materials on biochemistry and the science of taste, smell and flavor also are provided, along with good PowerPoint presentations, learning objectives and many other student resources. Creating test questions and study questions also has proven to be particularly challenging.

This past fall was the first time the Science of Cooking course was taught, and there already are 130 students enrolled in the spring 2011 semester, making it one of the largest classes taught at Minnesota State University Moorhead. Student evaluation of the course has been very encouraging. Initial assessment shows that the course helped them learn basic scientific principles. Students particularly favored using the "Good Eats" videos as a supplement to the course materials. However, more work is needed to develop laboratory materials. While they liked the experiments, students felt less enthusiastic about defining scientific problems and testing hypotheses. Creating graphs and analyzing trends also was difficult for some students. To adjust for this, short YouTube tutorial videos will be created for the class website. The course is a work in progress and likely still has a lot in common with "Hell's Kitchen." However, the materials are very interesting, and the course provides a great way to inspire students to see the world around them through new, scientific lenses.

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For more information:

- MIT's Kitchen Chemistry course: bit.ly/MITKitchenChemistry
- Some of the recipes Provost uses in his class: http://bit.ly/ATodayRecipes
- The Science of Cooking course website: www.mnstate.edu/provost/BCBT100

Below are some recipes Provost uses in his science of cooking class along with his science behind the food discussion points.

Alton Brown guacamole

Science behind the food

- Use the avocado dip, milk and water to help demonstrate the solubility of capsaicin from the mango pineapple hot sauce recipe.
- Explain the role of lemon or lime juice as an acid to create sour taste and inhibit enzymatic browning of plant matter.

INGREDIENTS

3 avocados, halved, seeded and peeled
1 lime, juiced
1/2 teaspoon kosher salt
1/2 teaspoon ground cumin
1/2 teaspoon cayenne
1/2 medium onion, diced
3 Roma tomatoes, seeded and diced
1 tablespoon chopped cilantro
1 clove garlic, minced

DIRECTIONS

1. Place the avocado pulp and lime juice in a large bowl. Toss to coat.
2. Drain and reserve the lime juice after all of the avocados have been coated.
3. Add the salt, cumin and cayenne. Mash with a potato masher.
4. Fold in the onions, tomatoes, cilantro and garlic.
5. Add 1 tablespoon of the reserved lime juice.
6. Let sit at room temperature for 1 hour and serve.

Shirley Corriher's lemon pan sauce chicken breast

Science behind the food

- Discuss how the browning reaction on the surface of the meat is needed to get the flavors. Browning will still occur with a nonstick pan, but the timing will be different.
- Explain that the wet breast will stick to the hot pan until the browning reactions create new surface molecules that no longer bind to the metal pan.
- Show that reducing (evaporating water and leaving other compounds behind) will intensify the flavor of the pan sauce.

INGREDIENTS

2 medium boneless, skinless chicken breasts
Salt and white pepper
2 tablespoons very mild olive oil or vegetable oil
1/4 cup dry white wine (cooking wine will do)
1/4 cup chicken stock
1/2 teaspoon instant chicken bouillon
1 tablespoon fresh thyme leaves
1 bay leaf
1/3 cup heavy cream or whipping cream
Finely grated zest of one lemon

DIRECTIONS

1. Sprinkle chicken breasts with salt and pepper. Place each breast between two pieces of waxed paper and lightly pound the thick end to make the breast more equal in thickness. It should about 1/2-inch thick.
2. Over medium-high heat, heat a heavy-bottomed 10-inch skillet until the upper edge of the pan feels hot to a quick touch. Remove from heat; pour in the oil and tilt to spread over the pan. Return to the heat and immediately drop the breasts into the pan with the rib side up. The breasts will sizzle, and they will be stuck.
3. This is a Zen moment. Think happy thoughts. Twiddle your thumbs, but don't touch the chicken. After about 90 seconds, which will seem like an eternity, the breasts will brown and release all by themselves. When the chicken easily releases from the pan, turn each breast over. Again, they will be stuck. Wait again until they brown and release, and then remove them to a platter.
4. Pour the wine and stock into the hot pan. Scrape the pan to loosen any stuck-on particles. Add the bouillon, thyme and bay leaf. Boil on high heat and reduce until only a few tablespoons remain. Stir in the heavy cream and continue to reduce until the sauce thickens. Stir in the lemon zest. Remove the bay leaf.
5. Slice each breast at an angle into three pieces. Spoon the sauce over the chicken and serve immediately.

Poached Pears with Caramel Sauce

Science behind the food

- Use this recipe to explain the science of browning and caramelization.

Poached Pears

INGREDIENTS

1 quart water
1 1/3 cups sugar
4 Bosc pears, peeled, cored and quartered
Possible Additions:
One cinnamon stick; 2 teaspoons whole cloves; black peppercorns or allspice berries; 1 lemon half; 1 split vanilla bean; 2-3 whole star anise; or 6-8 slices fresh ginger

DIRECTIONS

1. In a large saucepan, heat the water and sugar until warm and the sugar is dissolved.
2. Add any of the additions you want.
3. Slide the pears in and cover with a round of parchment paper with a small hole cut in the center. Keep the liquid at a very low boil and simmer the pears until cooked through, 15 to 25 minutes, depending on the pears.
4. Remove from heat and let the pears cool in their liquid.

Caramel Sauce

INGREDIENTS

1 cup sugar
6 tablespoons butter
1/2 cup heavy whipping cream

DIRECTIONS

1. Before you begin, make sure you have everything ready to go– the cream and the butter should be next to the pan, ready to put in. Making caramel is a fast process that cannot wait for you to hunt around for ingredients. If you don't work fast, the sugar will burn. Also make sure there are no children under foot, and you may want to wear oven mitts; the caramelized sugar will be much hotter than boiling water.
2. Heat sugar on moderately high heat in a heavy-bottomed 2- or 3-quart saucepan. As the sugar begins to melt, stir vigorously with a whisk or wooden spoon. As soon as the sugar comes to a boil, stop stirring. You can swirl the pan a bit if you want from this point on. Note that this recipe works best if you are using a thick-bottomed pan. If you find that you end up burning some of the sugar before the rest of it is melted, next time add a half cup of water to the sugar at the beginning of the process– this will help the sugar to cook more evenly, although it will take longer, as the water will need to evaporate before the sugar will caramelize.
3. As soon as all the sugar crystals have melted (the liquid sugar should be dark amber in color), immediately add the butter to the pan. Whisk until the butter has melted.
4. Take the pan off the heat. Count to three, and then slowly add the cream to the pan and continue to whisk to incorporate. Note than when you add the butter and the cream, the mixture will foam up considerably. This is why you must use a pan that can hold at least 2 quarts (preferably 3 quarts).
5. Whisk until caramel sauce is smooth. Let it cool in the pan for a couple minutes, then pour into a glass mason jar and let sit to cool to room temperature. (Remember to use pot holders when handling the jar filled with hot caramel sauce.) Store in the refrigerator for up to two weeks. Warm before serving.

Mango pineapple hot sauce

Science behind the food

- Discuss the cell signaling of pain and where capsaicin is found in the chili pepper.

INGREDIENTS

2 cups peeled, chopped mangoes
1 cup pineapple, crushed and drained
6 habernero peppers, blanched in vinegar and deseeded
4 jalapeño peppers, blanched and deseeded
1 teaspoon sugar
1 tablespoon molasses
1/4 cup lemon juice
1 teaspoon ground ginger or 1 tablespoon fresh minced ginger
1/2 teaspoon black cumin
1 teaspoon salt

DIRECTIONS

1. Strain peppers and discard seeds.
2. Blend all remaining ingredients until smooth. Adjust taste with lemon juice.

ASBMB Special Symposia series expands to China

BY JLYNN J. FRAZIER

Keynote lecturer
Michael M. C. Lai

The 2011 American Society for Biochemistry and Molecular Biology Special Symposia Series will include the Recent Advances in Pathogenic Viruses Symposium, being held July 24 – 26 in Guangzhou, China. This symposium will cover the molecular biology, pathogenesis and antiviral host defenses of a range of human viruses, including influenza virus, human immunodeficiency virus, herpes viruses, human papillomavirus, and hepatitis viruses B and C.

Michael M. C. Lai, a world-renowned molecular virologist, will present the keynote lecture on the molecular pathogenesis of the hepatitis C virus. Lai is a professor at Academia Sinica in Taiwan and currently is serving as editor-in-chief of the Journal of Biomedical Science. In addition to Lai, an outstanding and diverse group of plenary speakers will present their research in Guangzhou. For the most up-to-date listing, please visit the meeting webpage at bit.ly/ASBMB2011Virus.

Abstract submissions are being accepted now through April 30. Opportunities are available for the inclusion of both oral and poster presentations. However, space is limited, so we encourage all those who are interested in presenting at the meeting to submit their abstract early.

For additional information about this symposium and the many other exciting symposia being offered throughout this year, don't miss next month's ASBMB Today, which will include summary articles written by the 2011 Special Symposia organizers.

Jlynn J. Frazier (jfrazier@asbmb.org) is conference manager at ASBMB.

2011 ASBMB Special Symposia Series

www.asbmb.org/specialsymposia

JULY 20–23, Richmond, VA

Student-Centered Education in the Molecular Life Sciences II

J. Ellis Bell, *University of Richmond*

University of Richmond

JULY 24–26, Guangzhou, China

Recent Advances in Pathogenic Human Viruses

Kuan-Teh Jeang, *National Institute of Allergy and Infectious Diseases, NIH*

Douglas Lowy, *National Cancer Institute, NIH*

Guangzhou Baiyun International Convention Center

SEPT 27–Oct 2, Pacific Grove, CA

13th International ATPase Conference Na, K-ATPase and Related P-ATPase: Structure, Biology, and Medicine

Kathleen J. Sweadner, *Harvard Medical School and Massachusetts General Hospital*

Asilomar Conference Grounds

OCT 6–9, Snowbird, UT

Cellular Traffic of Lipids and Calcium at Membrane Contact Sites

Joint meeting with the Biochemical Society

Tim Levine, *University College London Institute of Opthalmology, London*

Will Prinz, *National Institute of Diabetes and Digestive and Kidney Diseases, NIH*

Snowbird Ski and Summer Resort

OCT 12-16, Snowbird, UT

Chemical, Synthetic and Systems Biology: New Directions of Biochemistry in the 21st Century

Arcady Mushegian, *Stowers Institute for Medical Research*

Aled Edwards, *University of Toronto, Canada*

Snowbird Ski and Summer Resort

OCT 27–30, Tahoe City, CA

Gene Regulation by Non-Coding RNAs

Richard Carthew, *Northwestern University*

Jennifer A. Doudna, *HHMI, University of California, Berkeley*

Granlibakken Resort and Conference Center

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ASBMB

Go ahead, brag a little

Learn how to work with your institution's communicators and with reporters to tell the world about your research

BY ANGELA HOPP

Ever wondered why the media picks up on certain research findings and ignores so many other (perhaps more scientifically important) ones? Or maybe why a colleague was highlighted in the campus magazine or company newsletter while you were overlooked? It usually has a lot to do with the personalities of and actions taken by the featured researchers themselves.

Getting your research news to the public isn't easy, but it's not impossible. The key is to create a narrative that can compete with organizational reportage of new hires, high-dollar grants and board meetings or media coverage of celebrities, sports, natural disasters, political snafus and crime. That means you have to be a good storyteller.

Most of the time, getting publicity starts with the formulation of a news release for the media or a story for an organizational publication.

Here's how to get the ball rolling:

1. **Understand the role of a news release or organizational publication.** News releases are meant to entice reporters to write and film stories about your work. Organizational publications are intended to reach a broad audience too, including alumni and investors or donors. Both are usually written in language that the general public — not just your colleagues — can understand.
2. **Get to know your institution's communicators.** Academic institutions, nonprofits, journal publishers and businesses employ writers and public relations professionals who can get your story to the media and other audiences. Some institutions have centralized communications offices; others have departmental or college-level offices; still others have campus- or company-wide magazines or alumni publications. *(Tip: On your introductory e-mail, the contents of which are described below, to your communicator, copy your dean or department head. A little pressure from the top can only help.)*
3. **Figure out how you fit into the media-relations process.** First, work with your communicator to craft a news release. Then he or she will run it by the involved parties and distribute it to the media. Interested reporters interview you, ask questions, take notes, capture audio and video, and produce an article or segment. Neither you nor your communicator has control over when, or if, a media outlet will use the story. Nor will you or your communicator review the content in advance. That's why it is vital to make sure reporters really understand what you tell them. *(Note: You will have more editorial control if you're working with an internal publication, but try to let the wordsmiths do what they do best. They wouldn't dare come into your lab and instruct you on your work.)*
4. **Answer the following questions in your introductory e-mail to your communicator.** Make your responses lengthy and oversimplified for a nontechnical audience.

   Who is involved in the project? Include titles, affiliations and duties. Do not use abbreviations or jargon. Note who should be consulted about or quoted in the release or article.

   What research results are you announcing? Use terms an eighth-grader would understand. Use anecdotes or examples of everyday objects to make technical matters clear for readers without scientific backgrounds.

   What agencies or foundations funded the research? If other entities supported the research in unique ways, include that as well.

   Where was the work conducted? Departments don't matter to the media, but agencies, institutes, research centers and universities do. Departments do matter for internal publications.

   Why would your work interest your audience? If you want to reach newspaper readers or TV viewers, make a solid case for what makes your research unique or powerful in layperson's terms. Provide links to

recent news coverage of this research area if possible. *(Tip: Study how the technicalities have been explained in past news reports.)*

How will your work immediately or one day affect the public? If your discovery, technique or project will affect those with a specific disease, tell your communicator about that disease. How many people does it affect in the U.S. or worldwide? What is living with it like? *(Tip: Try to make the story more about people and less about the technicalities of the science.)*

How can you use visuals to complement a TV or print report? What places, people or things can be photographed or videotaped? What kind of images do you already have? When will you be available for a photo shoot by your institution? *(Note: Media outlets usually will shoot their own photos.)*

5. **Keep your commitments.** When you agree to go public, you are making a significant commitment of time, patience and good faith. Sometimes it can take several weeks to complete a news release or story, depending on the availability of collaborators and the time needed for the approval process. Once a news release is distributed to the media, you must be flexible, willing and available for all interview requests. Provide your communicator with your e-mail address and work, home and mobile phone numbers, because you never know when the media will call. *(Remember: Never say anything to a reporter that you don't want on the record.)* XXX

Angela Hopp (ahopp@asbmb.org) is managing editor for special projects at ASBMB.

A nose for news: Tips from the pros

"If your research involves humans, and you want a story, don't even pitch me until you have identified a patient or subject who is willing to share his/her story, using his/her real name, or someone who could be helped, someday, some way.

"If your research is more abstract, be prepared with storytelling techniques: an exciting narrative about the obstacles that were overcome, a 'eureka' moment or a discouraging moment. Recruit other people for interviews, not just yourself: people who helped along the way (in the lab, in the field, in your childhood).

"Think of metaphors, classical allusions, biblical tales, songs, visual analogies — any way to translate your research into language a layperson can understand. The researchers who get featured have a way of explaining things visually in plain language. If I can't see it, I can't report it.

"Bonus points: emotion and personality. Be sure to include why you are passionate about what you do. What motivated you to pursue this line of inquiry?"

Carrie Feibel
Health and science reporter for Houston Public Radio

"My main goals are to help researchers feel comfortable talking to the media and show scientists how best to convey their main points. Sometimes we can interest the New York Times or CNN or a top blog through a freelance science writer. But even a mention in a small technical newsletter can achieve big results. One time a release that I wrote for an agronomy researcher piqued the interest of the publisher of a biotech industry newsletter. The result was that a company executive contacted our scientist, and they partnered to commercialize his discovery."

Susan A. Steeves
Media relations manager and science writer at Virginia Polytechnic Institute and State University

"This is about humans."

Christopher Joyce
Editor/correspondent for NPR's science desk

"The biggest thing I look for in a pitch is how your discovery or research affects everyday people. Don't just tell me what you did – take that one step further and explain the practical implication of your work. What does it mean for the woman next door? Why should she care? Are there any particular segments of the population it will affect more than others? The better you spell this out for me, in terms I actually understand, the more likely I am to write about you and your work."

Alexis GrantEditor
at U.S. News & World Report

To read more tips from the pros, go to the online version of this article at http://bit.ly/ATodayPR.

Barriers to minority funding

Recently, the ASBMB MAC undertook an initiative to identify the perceived barriers faced by underrepresented minority faculty applying for extramural funding

BY SONIA C. FLORES AND TAKITA SUMTER

Despite concerted national efforts to increase the participation of minorities in science, technology, engineering and mathematics, the number of underrepresented individuals in these fields remains disproportionately low. To help counteract this trend, federal funding agencies have introduced several initiatives to increase the numbers of underrepresented minority investigators participating in competitions for basic research support; nevertheless, minorities still submit only a small fraction of the total applications for federal funding.

The ASBMB assessment

To help address this problem, the American Society for Biochemistry and Molecular Biology Minority Affairs Committee recently undertook an initiative to identify perceived barriers faced by biochemistry, cellular biology and molecular biology faculty members from underrepresented groups or from minority-serving institutions when applying for extramural funding. We conducted a detailed assessment using surveys, interviews and a convened focus group discussion in an effort to identify accurately the perceived barriers for URM investigators in securing research funding. The ASBMB MAC working group engaged the strategy consulting firm AltshulerGray for these purposes; the working group sought to include perspectives of faculty, institutional administrators and program officers in the assessment.

Principal investigators who submitted grants to funding agencies and who self-identified as belonging to an underrepresented group or from an MSI received an explanation of the project and an invitation to participate in an online survey. Of the 159 investigators who were invited, 82 (52 percent) responded. Survey demographics indicated that respondents represented a wide range of institutions and career stages. The consultants conducted interviews of university administrators and program officers; survey respondents then participated in a two-and-a-half day focus group-style workshop.

We hope that the results of the surveys, interviews and focus group discussions will provide key information for the general academic community, scientific societies and funding agencies. In general, adequate mentoring was identified as an underlying need for all faculty participants, and a formal mentoring plan of action that impacts URM audiences is imperative.

Major barriers and needs

1. **Ineffective communication streams between URMs and funding agencies**

   The survey indicated that knowledge about available funding opportunities is lacking. The group felt that more user-friendly websites with a central repository of information would improve their awareness of funding opportunities. In addition to funding newsletters published by the sponsoring agencies, the group suggested that professional societies like ASBMB should develop a road map for new investigators to use to navigate the web of extramural funding. This document should describe the various funding and review processes, explain the requirements for grant submissions and provide tips for structuring successful applications.

2. **Lack of support networks for minority PIs**

   Lack of a strong network was identified as a major obstacle. Faculty members at large research institutions often are in environments with few minority peers, while faculty at smaller schools and MSIs have few colleagues who can serve as role models and mentors; the quality of applications reflects these deficiencies. Workshop participants suggested annual or semi-annual mentoring panels with program directors and senior investigators focusing on grant writing. To build upon the networks created by these workshops, an online community of minority scientists should be created. This social network would maintain regular mentor-

protégé dialogues and provide resources via web seminars on topics like how to choose a good mentor and how to navigate the funding process.

3. **Funding agencies have a review process that is less than clear**

For URM faculty who do submit proposals to federal funding agencies, the review process often seems frustratingly opaque; as a result, faculty members become frustrated and therefore less likely to reapply. To address this, the group expressed the need for a user-friendly flow chart clearly detailing review and award criteria and a presubmission process for applications. The group also expressed the need for continued efforts on behalf of faculty, professional societies and funding agencies to engage URMs as proposal reviewers.

> "…the review process often seems frustratingly opaque; as a result, faculty members become frustrated and therefore less likely to reapply."

4. **Leaky pipeline of minority talent**

The current pipeline of minority talent in academia is leaking at all stages, negatively affecting the entire research enterprise. These leaks reduce the number of minorities who ultimately pursue scientific careers and hamper the success of URM scientists. With too few minority students pursuing scientific studies, minority PIs, particularly those at smaller institutions and MSIs, often lack the trainees necessary to conduct research effectively. Ultimately, the number of applications funding agencies receive from minorities is limited by the number of URMs in STEM disciplines. Workshop participants offered several innovative ways for making science exciting and relevant for K–12 students in an effort to foster the interests of the next generation of scientists.

5. **Lack of URM-directed initiatives**

The group argued that additional URM-directed initiatives and nondirected funding opportunities should exist; however, simply making more targeted money available was not considered a panacea. Rather, any new grants must be structured for success and prepare grantees to enter the general funding pool. Thus, funding agencies could increase the length of seed awards and allow time for faculty to produce results, an issue particularly relevant at smaller institutions. Moreover, the need for awards targeting critical career stages (e.g., postdoctoral fellow to independent researcher and junior faculty to mid-career researcher) was highlighted. At the same time, applicants' work should be held to high standards that, though taking into account the unique circumstances at MSIs, encourage minority faculty to perform research that will sustain their competitiveness for future funding.

The problem of minority underrepresentation in the sciences is complex. It will take a concerted effort from all stakeholders to reverse this trend. However, there are opportunities for scientific societies, academic institutions, federal funding agencies and individual minority investigators to work together to increase the number of URM scientists actively and successfully participating in the national research enterprise. The MAC historically has employed an aggressive and multifaceted approach to increasing the representation, participation, visibility and contributions of minorities in the molecular life science disciplines and will continue these efforts.

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Focus on the ASBMB Undergraduate Affiliate Network

A look at the growth and development of the UAN since its inception in 2000

BY TODD WEAVER

Origins

The American Society for Biochemistry and Molecular Biology Undergraduate Affiliate Network was initiated by J. Ellis Bell in 2000 to "create a community of faculty involved with both research and undergraduate education, to promote the involvement of undergraduates in research and outreach activities and student centered learning and to provide a connection between students and their future careers."

The management of the UAN initially was included as part of the Educational and Professional Development Committee activities in 2002, and the first regional directors were appointed in 2003. That same year, the UAN was integrated into the Experimental Biology meeting concomitant with the education sessions being moved into separate satellite sessions. The UAN has grown during the past several years and has evolved a well-defined organizational structure that includes a chair, regional directors, numerous local chapters and, more recently, various awards directed at biochemistry and molecular biology undergraduate education, research, and K-12 outreach.

Organizational structure

The UAN started with six distinct regions (Northeast, North-Central, Northwest, Southeast, South-Central, and Southwest), and directors were appointed to serve as coordinators and recruiters for each region. Bell, who was the first UAN chairman, and these initial regional directors were instrumental in defining the core mission of the UAN.

Joseph Provost served as the second UAN chairman from 2006 to 2009, and during his tenure a number of important initiatives were designed and implemented. As Provost recalls, "The early years were devoted to defining the UAN role within the EPD and to understanding how to further the goals of the ASBMB to best serve primarily-undergraduate institutions' faculty and undergraduates. The initial idea was to promote interactions at all levels of the education system and create a community of educators and students. This was an exciting opportunity to have a real impact on the flow of students into science, in particular biochemistry and molecular biology." The current chairwoman of the UAN is Neena Grover of Colorado College.

Some of the UAN's initial goals were to establish best practices and standard protocols, finish developing the network's website and grow the activities of the UAN. Provost remembers, "We worked together to do all of this and create a separate committee which is still a part of the EPD but meets separately twice a year and has its own identity for organization. We were able to propose and get approved a budget, which was instrumental to mature the UAN."

Growth and development

In 2009, Weiyi Zhao was added to the ASBMB staff to oversee and develop UAN directives. Zhao's addition was instrumental in moving the UAN mission forward. In addition to her other duties within the education department, she serves as a conduit for the UAN within the ASBMB. Her assistance has been invaluable, and support from the ASBMB has been crucial to the success of the UAN.

The UAN now has grown to include 55 chapters within the six UAN regions. Currently, UAN regional directors include Ann Aguanno of Marymount Manhattan College and Quinn Vega of Montclair State University (Northeast), Marilee Benore of the University of Michigan-Dearborn and Todd Weaver of the University of Wisconsin-La Crosse (North-Central), Joseph Provost of Minnesota State University Moorhead (Northwest), David Bevan of Virginia Polytechnic Institute and State University and Takita Sumter of Winthrop University (Southeast), Benjamin Caldwell of Missouri Western State University (South-Central), and Neena Grover of Colorado College and Tester Baird of San Francisco State University (Southwest).

The UAN also publishes a bi-monthly online newsletter, Enzymatic, that covers UAN-related news as well

as undergraduate biochemistry and molecular biology education. A regular feature of Enzymatic is a series called "JBC in the Classroom," in which contributors explain how they use articles from the Journal of Biological Chemistry to teach biochemistry or molecular biology. The editor of Enzymatic is Marilee Benore, and Weiyi Zhao serves as managing editor.

The Undergraduate Affiliate Network was initiated by J. Ellis Bell in 2000.

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The current chairwoman of the UAN is Neena Grover of Colorado College.

UAN awards

Beyond the annual undergraduate poster competition, the UAN has implemented a number of additional competitive awards, which are supported by chapter dues.

Undergraduate research

The UAN has a particular interest in increasing undergraduate student participation in biochemistry and molecular biology research to stimulate interest in the life sciences. The Undergraduate Research Award supports undergraduate students conducting summer research by providing $1,000 to offset the costs for supplies. This past summer, eight students were presented with these awards to conduct summer research. The UAN also has established a travel award to offset one student's travel expenses for the annual meeting. Each regional chapter can nominate one student for this award.

Individual UAN chapters also may apply for a Regional Meeting Award to fund a small biochemistry and molecular biology meeting focused on the presentation of data and results by faculty members and their students. As part of the award, each region may give up to four additional $400 travel awards for students to present their findings at the ASBMB annual meeting. The UAN feels strongly that an immersive undergraduate research experience includes the presentation of data and results.

The UAN also has been instrumental in promoting incorporation of undergraduates and faculty from primarily-undergraduate institutions into the main platform scientific sessions at the annual meeting. In the past two years, eight undergraduates and 21 primarily-undergraduate institution faculty members have given such presentations.

Finally, the UAN administers the ASBMB Undergraduate Honor Society ($\Xi\Omega\Lambda$) to acknowledge outstanding students pursuing degrees in biochemistry or molecular biology. Faculty mentors nominate juniors and seniors each year for inclusion in the honor society based on their achievement in scholarly research, academic excellence and biochemistry and molecular biology-centered outreach activities.

Research-based education

The UAN has strengthened the connection of biochemistry and molecular biology faculty with high school students and science educators through its 7–12 Teacher Summer Research Award. This competitive award partners a BMB faculty member and undergraduate student with a high school science educator and a high school student to conduct hypothesis-driven research. These successful partnerships have provided both stipends ($4,000 for the teacher and $1,000 for the student) and unique opportunities for three high school teachers and three students during the past two years.

K–12 outreach

Service to the K–12 science community has become another focal point for the UAN. In fact, a number of awards have been earmarked for this purpose, including the Outreach Support Award, the Science Fair Award, the High School Research Award and the High School Scholarship Award. The outreach award provides funds to encourage local UAN chapters to promote science, technology, engineering and math educational activities. The science fair awards can be used by local UAN chapters to recognize excellence in BMB research by high school students. Each chapter can apply for up to five $100 awards. The final two awards have been developed to recognize and support BMB research conducted by high school students and prog-

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Teamwork: industry and academic perspectives

Teamwork is essential to all scientific discovery from academia to industry

BY QINGYU WU AND WEIPING JIANG

In team sports, no game is won by an individual. Michael Jordan, arguably the best player in basketball, could not have won six NBA championship titles without Scottie Pippen and other gifted teammates. In contrast, the public often perceives science as an endeavor pursued by lone individuals in isolated labs.

Most of us are familiar with Alexander Fleming's discovery of penicillin in 1928 upon noticing a contaminating mold that killed staphylococcal colonies in a culture dish. Few of us, however, know that Fleming's first publication on this observation drew little attention and that after nearly 10 years of unsuccessfully attempting to identify the fungal antibacterial ingredient, Fleming almost abandoned this line of research. It was Howard Florey and Ernst Chain's teamwork, starting in the late 1930s, that led to mass production and isolation of stable penicillin and successful testing in patients with bacterial infection (1). Fittingly, Fleming, Florey and Chain shared the Nobel Prize in physiology or medicine in 1945 "for the discovery of penicillin and its curative effect in various infectious diseases."

Teamwork in industry

Nowadays, team efforts are expected in drug development, which involves therapeutic concept validation, target identification, compound development, animal model testing and, ultimately, clinical trials. Specialists in different fields, including molecular biology, biochemistry, chemistry, physiology, pharmacology, toxicology and medicine, are required to work together to bring a drug from lab bench to bedside. Such a process is not necessarily easy. As Garret FitzGerald of the University of Pennsylvania stated recently, "a crisis has emerged in drug development … One reason is that too many steps are pursued in specialist isolation" (2). Indeed, molecular biologists and chemists who start the drug development process may not have sufficient knowledge in physiology and human disease to follow it to completion. Conversely, doctors who conduct clinical trials may not be familiar with modern techniques that are essential for understanding molecular mechanisms and identifying drug targets.

To bridge this gap, the National Institutes of Health has proposed to establish the National Center for Advancing Translational Sciences to build closer ties between basic science and drug development. This timely initiative at the federal level will help to foster teamwork, accelerating the discovery of new therapies and cures for diseases (3). Within the pharmaceutical industry, similar efforts are being made with the assembly of teams of basic scientists and clinicians who are involved in every stage of drug development.

Teamwork in academia

The concept of teamwork is not limited to drug development — it also applies to academic research. Michael Brown and Joseph Goldstein at the University of Texas Southwestern Medical School are legendary for their life-long collaborative studies on lipid metabolism. Nancy Jenkins and Neal Copeland, two of the top 50 most cited biomedical scientists in the world today, are both life and lab partners who work with mouse models of human disease.

As science advances at an ever faster pace, expertise in different fields often is required to address more complex problems. When asked about the importance of an interdisciplinary approach in addressing urgent scientific questions, Christian de Duve, who shared the Nobel Prize in physiology or medicine with Albert Claude and George E. Palade in 1974 for their discoveries of cell organelles, replied that "in biomedical research, multidisciplinary collaboration has become mandatory" (4). Investigators with diverse backgrounds often look at problems from entirely different angles and may apply different techniques to solve them. The advantage of collabora-

tive approaches in research is well recognized. In fact, nowadays most scientific publications have authors from multiple departments and institutions, reflecting the reality that current research is done collectively and no longer individually.

Making it work

Teamwork in industry and teamwork in academia may differ in goals and organization charts. For example, a product that requires cooperation from multiple departments may be the ultimate goal in industry, while a publication that requires collaboration from several laboratories may be the final aim in academia. However, the requirements for successful teamwork in both sectors are quite similar. Every team member needs to understand the overall objective of the project, his or her responsibility, the timeline involved, potential problems and their solutions and alternative strategies.

In addition, clear and timely communication between team members is critical to ensuring the smooth transition of the project from one stage to another. The constant interactions between project managers, scientists and associates in industry as well as principal investigators, postdoctoral fellows and graduate students in academia require professional respect, common language and knowledge of the subject and critical evaluation of experimental results. Identifying and solving problems encountered early on, and even taking approaches to prevent potential problems from occurring, are essential to overall efficiency and success.

Collaborations between companies and academic institutions are increasing, but they have a long way to go. Different regulations and practices may exist between the two sectors with regard to issues like confidentiality agreements, material transfers and associated documentation. It is not difficult, however, to foresee that fruitful collaborations can be crafted if both sides understand clearly the benefits of working as a team. Together, we can advance science and technology at a faster pace, making our world a better place for generations to come.

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REFERENCES

1. Fleming, A. (1964) Penicillin. Nobel Lectures, physiology or medicine 1942–1962. Elsevier Publishing Company, Amsterdam.
2. FitzGerald, G. (2010) Drug development needs a new brand of science. *Nature* **468**, 869.
3. Wadman, M. (2010) Francis Collins makes the case for an institute focused on translational research. *Nature* **468**, 877.
4. de Duve, C. (2010) The joy of discovery. *Nature* **467**, S5.

Focus on ASBMB Undergraduate Affiliate Network *continued from page 25*

ress toward a BMB baccalaureate degree. The High School Research Award provides $200 for a student to conduct research, while the High School Scholarship Award supplies $1,000 toward the pursuit of a BMB baccalaureate degree.

Future

During the past eight years, the organizational structure of the UAN has been formalized, and its goal of creating a community of faculty members engaged in research and education aimed at increasing participation of undergraduates has come to fruition. As Bell states, "Thanks to the hard work over the years of the many people involved with the UAN it has certainly gone a long way toward fulfilling the original hopes for it. As ASBMB rolls out its accreditation plan over the next year or two, the UAN will continue to play a critical role in advancing student-centered education in the molecular life sciences and, through its widespread faculty and student network, provide leadership in the development of young faculty members committed to the integration of research into every aspect of undergraduate education in biochemistry and molecular biology."

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For more information

For more on the ASBMB Undergraduate Affiliate Network, including information on how to join, go to www.asbmb.org/UAN.

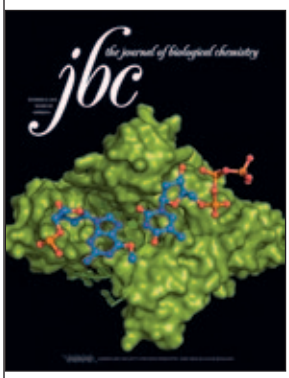
jbc THE JOURNAL OF BIOLOGICAL CHEMISTRY

Thick and thin: a tale of friendships and findings

Philip W. Majerus retraces the highlights of his career in a new JBC "Reflection"

BY ANGELA HOPP

You've probably seen the television commercials that go something like this: A healthy-looking middle-aged woman, likely on the tennis court or grocery shopping, reminds you to talk to your doctor — like she did — about how regularly taking a low dose of aspirin can lower your risk for heart attack, stroke and blood clots.



You've probably known someone on a low-dose aspirin regimen. You might know someone who is alive today because of it. You even might have tossed back your dose this morning.

What you might not have heard is that the researcher who first proposed the low-dose aspirin therapy that saves thousands of lives every year and who delineated the role of platelets in blood clotting and thrombosis recently shared his story in the pages of the Journal of Biological Chemistry.

In a "Reflections" article published in the Feb. 18 issue of the JBC (1), Philip W. Majerus, a longtime professor in the hematology division of Washington University in St. Louis, modestly retraces the highlights of his career.

Majerus begins his tale, "Wandering Through the Laboratory," by recounting an important period as a research associate in the then-National Heart Institute's biochemistry laboratory headed by Earl Stadtman. It was during that time that he formed a close and lasting bond with section leader P. Roy Vagelos.

Majerus then takes readers into his domain at Washington University, where he joined the faculty in 1966 and has remained ever since. It was there that he and colleague Stuart Kornfeld learned hematology together and forged a lifelong friendship.

Majerus writes: "When I got to St. Louis, I continued my studies of the structure and function of acyl carrier protein. It soon became clear, however, that working on fatty-acid synthesis in E. coli was not going to cut it in a hematology division. So, Kornfeld and I made a conscious effort to switch to research in hematology."

As fate would have it, Vagelos soon joined the university's ranks too, as biochemistry chairman.

Long story short, Majerus and colleagues eventually delineated the mechanism by which aspirin affects platelet function, defined the scope of inositol signaling reactions and accomplished a number of other scientific feats. Yet despite the hugely impactful nature of his career, Majerus tells his story in the JBC quite matter-of-factly.

Of his aspirin work, he humbly writes: "Late one afternoon, I looked in the St. Louis phone directory for aspirin and found a company in town, Rexall, that made aspirin tablets. I called after hours, and a man answered the phone. I explained what I wanted: 100 bottles of 160 mg aspirin and the same of a matched placebo. The man said he could make them without any problem and would deliver them to my lab the next morning at no charge. Thus, we did the first randomized, controlled trial of aspirin for prevention of thrombosis — and it worked."

Then again, for Majerus, that was only one peak in a long career full of summits. And, he emphasizes, so much work still remains to be done.

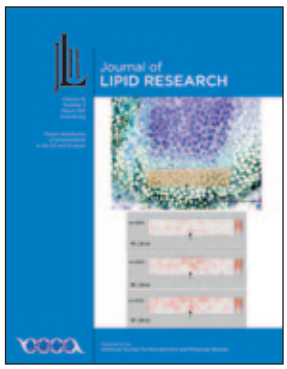
Angela Hopp (ahopp@asbmb.org) is managing editor for special projects of the Journal of Biological Chemistry.

REFERENCE

1. Majerus, P. W. (2010) Wandering through the laboratory. *J. Biol. Chem.* Dec. 30 (epub ahead of print).

JLR THE JOURNAL OF LIPID RESEARCH

Positive results for statin trials in JLR



Clinical trials in the March issue use atorvastatin and simvastatin combined with vitamin B3 to control cholesterol levels

BY MARY L. CHANG

The control of cholesterol levels in the body by medication is one of the top topics in lipid research. Statins are a class of drug that decreases cholesterol levels by inhibiting the action of an enzyme called HMG-CoA reductase, a major player in the production of cholesterol in the liver. Two papers in the March issue of the Journal of Lipid Research summarize results from clinical trials that tested statins on patients with cholesterol-related health problems. Andre J.

Tremblay of Laval University in Quebec City, Canada, and colleagues studied the effect of atorvastatin in their paper "Atorvastatin increases intestinal expression of NPC1L1 in hyperlipidemic men" (1). The results from this study were encouraging: Patients who took the drug daily for 12 weeks experienced increased cholesterol absorption and elevated mRNA levels of key proteins involved in cholesterol homeostasis.

Another statin, simvastatin, was combined with vitamin B_3 (niacin), a known lipid modulator, in the five-year landmark "High density lipoprotein-atherosclerosis treatment study" conducted by the National Heart, Lung and Blood Institute. In their manuscript entitled "Cholesterol esterification and atherogenic index of plasma correlate with lipoprotein size and findings on coronary angiography" (2), Milada Dobiášová of the Academy of Sciences of the Czech Republic and fellow researchers looked at specific clinical measurements to determine the effectiveness of this drug regimen. This group's analysis supports the idea that there are in vivo functional differences between patients with elevated lipid levels that correlate with varying phenotypes of atherosclerosis. They also show that HDL is a useful biomarker for predicting cardiovascular outcomes and that niacin aids in controlling cholesterol levels.

Mary L. Chang (mchang@asbmb.org) is managing editor of the Journal of Lipid Research.

REFERENCES

1. Tremblay, A. J., et al. (2011) Atorvastatin increases intestinal expression of NPC1L1 in hyperlipidemic men. *J. Lipid Res*. **52**, 558 – 565.
2. Dobiášová , M., et al. (2011) Cholesterol esterification and atherogenic index of plasma correlate with lipoprotein size and findings on coronary angiography. *J. Lipid Res*. **53**, 566 – 571.

Membership has its privileges

ASBMB members now get reduced publication fees for JBC, JLR and MCP

BY ANGELA HVITVED

The American Society for Biochemistry and Molecular Biology's member discount on publication fees now is available for all three ASBMB journals: the Journal of Biological Chemistry, the Journal of Lipid Research and Molecular and Cellular Proteomics.

Manuscripts on which the corresponding author is a regular ASBMB member are eligible for discounts on page charges and color figure fees. ASBMB members receive a discount of $10 per page on page charges and $50 per color figure fee. Although the total discount will vary by manuscript depending on page length and number of figures, ASBMB members save, on average, $240 per manuscript.

Additionally, authors who choose to publish using the Author Choice option save an additional $500 off the $2,000 Author Choice fee. Author Choice is a publishing option for authors who would like the final redacted version of their manuscript immediately available on PubMed Central and the journal's website. (The Author Choice fee is in addition to regular figure and page fees.)

Authors of manuscripts submitted to MCP will notice another set of changes in publication fees. In an effort to more equitably distribute publication costs, the fee for color figures has been reduced by $100 (from $300 to $200). Additionally, half-tone figures, which previously cost $25 per figure, are now free. This new fee schedule came into effect on Jan. 1. The journal hopes to continue taking advantage of the savings gained by publishing online only and to pass these savings along to authors as much as possible.

Angela Hvitved (ahvitved@asbmb.org) is managing editor of Molecular and Cellular Proteomics.

A scientist in marketer's clothing, or vice versa?

A journey from crystallographer to marketing entrepreneur

BY MARY CANADY

I am incredibly lucky to have found a career in marketing that I love, but realizing my true career required a series of "aha" moments that unfolded over many years. Marketing is not about the phone calls you receive at dinnertime; it's about developing products that meet user needs. That restriction enzyme that helped you with your cloning and that centrifuge you rely on, along with many other things you regularly use in the lab, were designed for you with a lot of help from marketers.

Aha! Well, a series of ahas …

My career boils down to three moments that I remember clearly. As an undergrad, I started school not knowing what I wanted to do. I bounced from law to physical therapy to bioengineering. However, in biology class sophomore year, I remember hearing about proteins and DNA. Wow, the building blocks of life. That was my first aha moment, and I became a biochemistry major.

In grad school at Duke University and later the University of California, Riverside, I knew I wanted to study protein function, and X-ray crystallography was the thing for me. Determine how the building blocks of life combine in 3-D to carry out biological processes? Bingo — aha number two! I also was lucky to work with some crystallography pioneers — David and Jane Richardson showed me how to take precession photographs on film and to visualize proteins. Alex McPherson, my fantastic PhD advisor, taught me how to crystallize proteins and solve structures (along with a great mentor, Steve Larson), and I even sent experiments on a space shuttle. I also started realizing that crystal structures were a great way to make nice visualizations, and I created one that was featured on the cover of the San Diego Supercomputer Center newsletter.

Aha number three was a long time coming, but I had fun along the way. In my postdoctoral fellowship, I actually moved away from X-ray crystallography because I had a fantastic project involving the conformational change of a virus. It was cool not only because I got to do a lot of different types of experiments (yes, I love working at the bench) but also because it challenged me to learn how to communicate the results. I also designed my lab's website and found that I enjoyed it a lot. At the end of my postdoc, I realized staying in San Diego was important to me and that getting a job outside of academia would allow me to stay.

My first job was during the genomics boom working at a startup called GeneFormatics, which used protein structure prediction models to determine functions of genes. I dabbled in bioinformatics, and when the company eventually folded, it gave me the opportunity get a job at Life Technologies (then Invitrogen) as an informatics product manager in the marketing department. My aha moment came when I was learning about different concepts in marketing, such as positioning and branding. These concepts, when understood as a whole, are the basis for developing and improving

Mary Canady is the founder of Comprendia, a firm specializing in helping biotechnology and life science companies grow through the creation, commercialization and communication of value. She has a doctorate in biochemistry and 10 years of research experience at Duke University, University of California Riverside and The Scripps Research Institute. In 2000, Mary left academia and has worked in marketing and business development roles at Invitrogen, EMD Biosciences and ActiveSight (Rigaku).

products that people — in our case, scientists need. Here was a chance for me to make a difference in life scientists' progress.

In 2008 I took my show on the road, so to speak, and started a marketing consulting company, Comprendia. I bootstrapped the company, and my web and creative skills helped me get started. I also work with talented developers and designers who help me with projects that are more involved. We provide everything from product-development consulting to printed brochures to websites and applications. We do most things virtually and have partners and clients all around the world.

What does a marketer do?

Life science marketers usually split their time between strategic and tactical marketing activities. Strategic marketing is the work required to develop products that customers need and involves market and scientific research, competitive analyses, forecasting and working closely with a research and development group. It doesn't end after the product is launched, as there is continuous competition as well as scientific advances. Life science companies stay tuned to all of these changes through their marketing department, resulting in products that always are improving.

Tactical marketing is the part of the job that you probably are more familiar with: it's the advertising and sales portion. We need to communicate the value of the products we've worked so hard to make for you. Now, some people say that a good product will sell itself. That's true to some extent, but in this crowded marketplace, scientists like to know about and understand the value of the product before they buy it.

Is marketing for me?

As you can see from my history, marketing was in the cards for me long before I even knew it. I enjoy all aspects of marketing but have the most fun with the tactical part. I love, for example, creating a web application and seeing how many scientists use it and taking the feedback we get to improve the product. To me, it's the equivalent of standing over a protein gel waiting for it to destain. However, the activities of a marketer can be quite varied, and even if you don't see yourself having as much fun with this aspect, there are many marketing positions that involve a lot more strategic than tactical work. Having a strong science background is of course very helpful for these positions, and the analytical skills you use to interpret your data can help you understand forecasting and planning. Marketers interface with almost every department in a company — R&D, tech service, sales and management — and it really is a very interesting job with great travel and growth opportunities.

How do I get into marketing?

You're lucky because there is so much information available about careers outside of R&D now. There even are classes offered by the American Marketing Association in many areas of the country. Take your destiny into your own hands and find ways to talk to people who could help or hire you. As early as possible, look at companies that are hiring marketers (or product managers) and find the areas in which they're hiring. Remember, I got my break in marketing by being in the informatics field — could you steer your work into a hot area? I've met many ambitious young scientists who are proactively creating a niche for themselves while in academia. I'm also a big proponent of face-to-face networking — find (or even start!) networking groups in your area. We founded the San Diego Biotechnology Network, which now has 6,000 members and helps life scientists to connect and learn.

In summary, make those aha moments come more quickly by opening yourself up to careers outside of R&D now. I'm happy about my career path, as I was able to learn and make many great contacts along the way. Make sure you're getting the most out of every situation you're in and don't be afraid to branch into other areas, as they can be very rewarding on both the individual and community level. XOXO

Lipotoxicity and fatty acid-mediated regulation of sphingolipid biosynthesis

BY L. ASHLEY COWART

The U.S. Centers for Disease Control and Prevention state that more than 30 percent of the U.S. population is obese, constituting a significant threat to public health. The deleterious effects of obesity largely stem from the perturbation of endocrine function and whole-body metabolism, one outcome of which is increased plasma free fatty acids. FFA provide cells with a rich source of energy, but when their concentrations exceed the cell's capacity for use or storage, they induce apoptosis, insulin resistance and other dysfunctions collectively referred to as "lipotoxicity"(1). This occurs via initiating stress responses, regulating transcription and promoting production of bioactive lipids.

Sphingolipid synthesis generates more than 1,000 different molecules, many of which have distinct signaling functions. While the best-characterized sphingolipids are ceramide and sphingosine-1-phosphate, recent studies demonstrate additional roles for other sphingolipids. With the diverse impacts of sphingolipids on cell programs, it is not difficult to see why their aberrant production may contribute to disease processes (2).

How do fatty acids regulate sphingolipid synthesis? The first hint arose from the observation that sphingolipid synthesis depends on concentrations of serine and palmitate, substrates for the first enzyme in sphingolipid biosynthesis, serine palmitoyltransferase (3). This is due to the relatively high K_m of the enzyme for these substrates and suggests that increasing FFA would increase cell sphingolipids. Indeed, this is observed in cell culture, rodent obesity models and obese humans. Additionally, our group demonstrated that palmitate treatment increased sphingosine-1-phosphate through escalating expression of the sphingosine kinase 1 gene (4). Moreover, metabolic labeling demonstrated that palmitate generated ceramide through sphingolipid catabolism, which may occur through stress-induced activation of sphingomyelinases (5). Thus, multiple mechanisms contribute to FFA regulation of sphingolipid synthesis.

Mechanisms by which fatty acids regulate sphingolipid biosynthesis. Fatty acids enter the cell primarily through plasma membrane transporters. Esterification to CoA allows their utilization for sphingolipid biosynthesis. Mitochondrial fatty acid metabolism causes oxidative stress, which may promote sphingolipid catabolism to generate ceramide.

Many studies in this area have considered FFA en masse; however, recent work reveals distinct actions of specific FFAs. For example, oleate (C18:1) overcomes palmitate-induced outcomes in many experimental settings. We observed that oleate attenuated both palmitate-mediated increase in sphingosine kinase 1 (4) and ceramide. In light of these recent findings, it becomes intriguing that obesity increases plasma saturated FFA, suggesting that not only total FFA but also their relative concentrations regulate cell sphingolipid profiles. This and other areas remain underexplored, including the potential regulation of sphingolipids by FFA import and esterification to CoA by Acyl-CoA synthetases. These routes of investigation present rich opportunities for further discovery.

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REFERENCES

1. Unger, R. H., and Scherer, P. E. (2003) Gluttony, sloth and the metabolic syndrome: a roadmap to lipotoxicity. *Trends Endocrinol. Metab.* **21**, 345–352.
2. Hannun, Y. A., and Obeid, L. M. (2008) Principles of bioactive lipid signaling: lessons from sphingolipids. *Nat. Rev. Mol. Cell. Biol.* **9**, 139–150.
3. Merrill, A. H., Jr., Wang, E., and Mullins, R. E. (1988) Kinetics of long-chain (sphingoid) base biosynthesis in intact LM cells: effects of varying the extracellular concentrations of serine and fatty acid precursors of this pathway. *Biochemistry* **27**, 340–345.
4. Hu, W., Bielawski, J., Samad, F., Merrill, A. H., Jr., and Cowart, L. A. (2009) Palmitate increases sphingosine-1-phosphate in C2C12 myotubes via upregulation of sphingosine kinase message and activity. *J. Lipid Res.* **50**, 1852–1862.
5. Clarke, C. J., and Hannun, Y. A. (2006) Neutral sphingomyelinases and nSMase2: bridging the gaps. *Biochim. Biophys. Acta* **1758**, 1893–1901.

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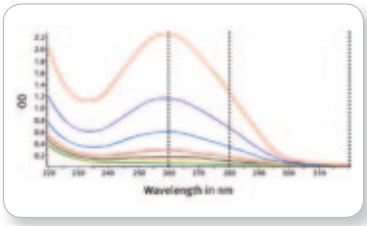

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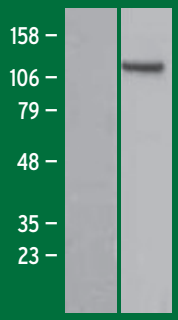

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