ASBMB 2010 SPECIAL SYMPOSIA — REGISTER EARLY AND SAVE!

ASBMB today

June 2010

INSIDE THE JOHNS HOPKINS INSTITUTE FOR NANOBIOTECHNOLOGY

American Society for Biochemistry and Molecular Biology

ANNUAL REVIEWS
The Essential Resource for Biochemistry Research

Annual Reviews offers comprehensive, timely collections of critical, topical reviews written by acknowledged experts. Annual Reviews journals examine 40 focused disciplines within the Biomedical, Life, Physical, and Social Sciences. Our Editorial Committees are specialists in selecting and synthesizing literature into concise, insightful review articles. As a result, Annual Reviews journals are among the most highly cited in scientific literature and are consistently ranked within the top ten of journals for their disciplines as indexed by the ISI® Journal Citation Reports (JCR®).

Annual Review of Biochemistry

Volume 79 • July 2010 • Online & In Print • http://biochem.annualreviews.org

Editor: Roger D. Kornberg, *Stanford University School of Medicine*

The *Annual Review of Biochemistry, in publication since 1932,* sets the standard for review articles in biological chemistry and molecular biology. Since its inception, these volumes have served as an indispensable resource for both the practicing biochemist and students of biochemistry.

Access this and all Annual Reviews journals via your institution at www.annualreviews.org

Personal copies available at a reduced rate. Institutional site license options available. Contact Annual Reviews for details.

TABLE OF CONTENTS FOR VOLUME 79:

ANNUAL REVIEWS • *A Nonprofit Scientific Publisher • 40 Journals • Since 1932*

TEL: 800.523.8635 (US/CAN) • TEL: 650.493.4400 • FAX: 650.424.0910 • EMAIL: service@annualreviews.org

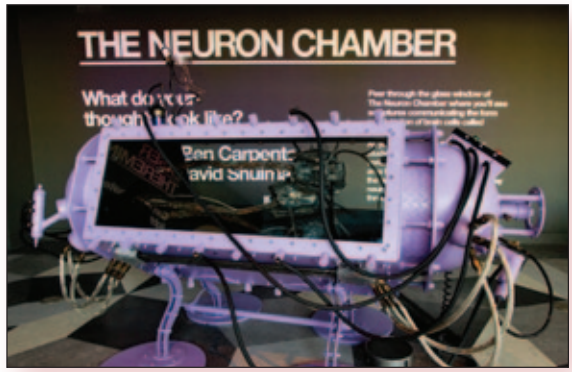
contents

JUNE 2010

On the Cover:
The Johns Hopkins Institute for NanoBioTechnology brings together biologists, physicians and engineers to unlock the potential of nanotechnology. 16

society news

feature stories



Where art meets science. 14

Snapshots of the annual meeting. 20

in every issue

podcast summary

Check out this month's podcast interview with outgoing ASBMB President Gregory Petsko.

To hear this and other podcasts, go to www.asbmb.org/Interactive.aspx.

ASBMB today

A monthly publication of
The American Society for
Biochemistry and Molecular Biology

Officers

Gregory A. Petsko *President*
Suzanne R. Pfeffer *President-Elect*
Mark A. Lemmon *Secretary*
Merle S. Olson *Treasurer*

Council Members

Dafna Bar-Sagi Ruma V. Banerjee
Benjamin F. Cravatt Joan A. Steitz
Thomas E. Smith Ann M. Stock
James A. Wells Adrian Whitty

Ex-Officio Members

Ellis Bell
Chair, Education and Professional Development Committee

Joan W. Conaway
Chair, Meetings Committee

John D. Scott
Chair, Membership Committee

Craig E. Cameron
Chair, Minority Affairs Committee

Laurie S. Kaguni
2010 Annual Meeting Program Coordinator

William C. Merrick
Chair, Public Affairs Advisory Committee

Toni M. Antalis
Chair, Publications Committee

Herbert Tabor
Editor, *JBC*

Ralph A. Bradshaw
A. L. Burlingame
Co-editors, *MCP*

Edward A. Dennis
Joseph L. Witztum
Co-editors, *JLR*

***ASBMB Today* Editorial Advisory Board**

Alex Toker
Chair

Greg P. Bertenshaw Craig E. Cameron
A. Stephen Dahms Irwin Fridovich
Jonathan Gitlin Richard W. Hanson
Elizabeth A. Komives Bettie Sue Masters
Luke A. O'Neill Duanqing Pei
Carol C. Shoulders Robert D. Wells

ASBMB Today

Nicole Kresge *Editor*
nkresge@asbmb.org

Nick Zagorski *Science Writer*
nzagorski@asbmb.org

Nancy J. Rodnan *Director of Publications*
nrodnan@asbmb.org

Barbara Gordon *Executive Director*
bgordon@asbmb.org

For information on advertising, contact
Capitol Media Solutions at 800-517-0610
or Danf@capitolmediasolutions.com

ASBMB

www.asbmb.org

2008 APEX AWARDS FOR PUBLICATION EXCELLENCE

president's message

Muchas Gracias, Amigos

BY GREGORY A. PETSKO

First off, let me apologize for not mentioning everybody. It's just that there have been so many. When I took the job as president-elect of the American Society for Biochemistry and Molecular Biology, three years ago, I never imagined how much help I was going to need and how much I was going to get. But, before I start thanking people, there are a few things I want to say in this, my last President's Message, about the state of the society, and the state of biochemistry, in mid-2010. I will start by congratulating Suzanne Pfeffer, the president-elect, on being chosen to lead the society starting in July of this year. I've had the pleasure of working with her since her election, and I can tell you that ASBMB is going to be in superb hands.

Right now, our society is in very good shape. I claim no credit for that; it was in very good shape when it was handed to me by Heidi Hamm. Of course, we took a hit in our investments just like everyone else when the financial crisis hit in late 2008, but I'm delighted to report that, thanks to the conservative nature of our investments and an outstanding job of managing them by Treasurer Merle S. Olson, the Finance Committee and ASBMB Director of Finance Steve Miller, our losses have been more than recouped. I only wish my 401K was doing as well.

But, the health of the society extends well beyond the financial. We just concluded a spectacularly successful annual meeting in Anaheim, Calif., (the one place in the world where it's actually a compliment to be called a "Mickey Mouse operation"). Every session I went to was extremely well attended, and the plenary lectures were outstanding. The Program Committee, headed by Laurie S. Kaguni, deserves rousing congratulations from all of us.

Our journals also are in fine shape, and we are fortunate to have, in Nancy Rodnan, a wonderful director of publications. Our flagship publication, the Journal of Biological Chemistry, which continues under the able leadership of Herbert Tabor, has just had both its mission statement and its website overhauled. I urge you to check both out, and please consider it for your next hot paper. The Journal of Lipid Research is the leading publication in its field, as is Molecular and Cellular Proteomics, which has, as of this year, become an entirely online journal, presaging what I think is an unstoppable trend that will sweep across all of scientific publishing. And speaking of new websites, I hope you've had a chance to look at the new online site for ASBMB Today. When I became president, one of my goals was to make ASBMB Today must reading for our members. I think we've gone a long way toward achieving that goal, and it's due largely to the tireless and creative efforts of its editor, Nicole Kresge. She's been kind enough to allow me free reign to be as provocative and, I hope, entertaining as possible in my president's messages, and thanks to her, it's been a lot of fun writing them.

I particularly am proud of the public affairs work the society has done over the past two years. Under the leadership first of Ralph Bradshaw and now William Merrick, our Public Affairs Advisory Committee (more-than-ably assisted by Peter Farnham, our public affairs director, and a series of superb science policy fellows, including the current holder of that title, Kyle Brown) has raised the profile of the society in Washington enormously. The ASBMB is a major player in

the public affairs work of FASEB and the Coalition for Life Sciences and has had a leadership role in matters ranging from the stimulus package, to National Institutes of Health and National Science Foundation funding levels, to the battle between creationism and evolution in our public schools.

Not everything is perfect, of course. We face some major challenges in the coming years, ranging from the winds of change that are sweeping over all scientific journals to the task of keeping a large and diverse scientific meeting interesting. The challenge I remain most concerned about, however, is our membership: it is still too densely populated with middle-aged, white male academics. We need more minority members, more female members, more foreign members, more members from industry and, especially, more young members. I am encouraged that Suzanne plans to make this issue one of the focuses of her presidency, and I wish her all the best in tackling it.

Many of our challenges, of course, are a reflection of the challenges facing science itself. Some of the biggest of these are monetary. Unless the NIH budget is increased substantially in 2011, we face a "cliff" the size of the Grand Canyon, in the form of far too many proposals and not nearly enough money to fund even the very best. In addition, increasingly, we are seeing the direction of science dictated from the top down, by a small number of powerful scientists, funding agency bureaucrats and patient advocacy-driven congressional mandates, rather than from the bottom up by the ideas of individual investigators. My predecessor, Heidi Hamm, first sounded the alarm about this trend, and ASBMB has mobilized our fellow societies, through the Federation of American Societies for Experimental Biology, in an attempt to turn the tide. The fight is far from won, and the battle will continue on Suzanne's watch, but everyone needs to be mindful of this problem and agitate to restore investigator-driven science to its rightful place as the driver of our priorities.

Years of lean funding have led to a climate that is discouraging some of our best young people from entering, or remaining in, science. They also are bleeding away a generation of mid-career investigators just when their leadership is needed most at many institutions. I don't know whether the answer lies in a commitment by the government to provide stable funding for our major grant-making agencies or in a reduction in the size of all awards so that more can be funded, or both, but, I do know that the roller coaster must stop. Unfortunately, that may depend on a healthy, growing economy, and your guess is as good as mine about the prospects for that.

Biochemistry itself also is at something of a cross roads. The quintessential reductionist science, it is being eclipsed in some quarters by the frenetic data-gathering efforts of genomics (and other "-omics") and the mathematically driven modeling of systems biology. I, for one, remain unconvinced that reams of data inevitably lead to big insights, and that to model something means you understand it in depth. For me, biochemistry remains a vital and essential science, as important a part of the efforts of modern biology as any other discipline. But, I think we need to do a better job than we have in making that case to young scientists, the funding agencies, our governments and the lay public. Integrating some of the methods from genetics, genomics and systems biology into our own work might not be a bad idea either.

I'll continue to write about all this, of course, in my regular monthly column for Genome Biology, as well as in occasional opinion pieces for BMC Biology and EMBO Reports. I may even revisit these pages from time-to-time, as I love the audience they reach. But for now, it's time for El Presidente, as one member called him, to say "Adios."

From time to time, members have asked me if there was anything that surprised me about being president. It probably was the easiest question I've had to answer. When I started this job, I liked ASBMB a lot, but, I didn't

2010 ASBMB Special Symposia

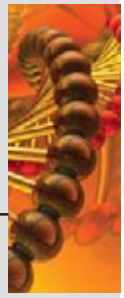
Now Open For Registration & Abstract Submission

September 30 – October 4, 2010

Transcriptional Regulation by Chromatin and RNA Polymerase II

Granlibakken Resort, Tahoe City, CA

Organizer: Ali Shilatifard
Stowers Institute for Medical Research



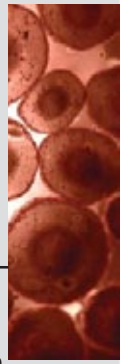
October 14 – October 17, 2010

Biochemistry and Cell Biology of ESCRTs in Health and Disease

Snowbird Resort, Snowbird, UT

Organizer: James Hurley
National Institute of Diabetes and Digestive and Kidney Diseases

Phyllis Hanson
Washington University School of Medicine



October 21 – October 24, 2010

Post Translational Modifications: Detection and Physiological Evaluation

Granlibakken Resort, Tahoe City, CA

Organizer: Katalin Medzihradszky
University of California, San Francisco

Gerald Hart
Johns Hopkins University School of Medicine

October 28 – October 31, 2010

Biochemistry of Membrane Traffic: Secretory and Endocytic Pathways

Granlibakken Resort, Tahoe City, CA

Organizer: Suzanne Pfeffer
Stanford University School of Medicine

Vivek Malhotra
Center for Genomic Regulation, Barcelona, Spain

www.asbmb.org/meetings

ASBMB

love it. I do now, and that was something I never expected to happen. You normally don't love something as impersonal as an organization, but I was amazed at how easy it was to love ASBMB once I really got to know it. That was entirely due to the people involved with it, and I want to say thanks to all of them from the bottom of my heart.

First and foremost, my heartfelt gratitude goes to Barbara Gordon, the society's executive director, for showing me the ropes and keeping this chronic procrastinator mindful of his duties. Her patience, good humor and all-around competence were a constant source of support and encouragement. I can say pretty much the same about Jessica Homa, Joan Geiling, Sarah Crespi, and all the ASBMB staff (too numerous to mention here, but see http://bit.ly/cSQTJH for a complete list). The dedication that they have to the society is heart-warming, and their tireless efforts on its behalf are one of the main reasons for its continued success.

I must not forget to offer my thanks, and my deep respect, to those members who devote their time and efforts to our council and to our standing committees as well (a list can be found at http://bit.ly/cetJQB). It is to them, not the President, that the real work of governing the society falls, and we have a remarkable group carrying that out. You see, I rapidly came to understand that there must be something special about ASBMB if so many terrific scientists, all of whom are incredibly busy, would make its service a priority in their lives. That was when I realized that I had started to feel more than just a liking for it.

Last, and by no means least, I want to say thank you to you, our members. Thank you for making biochemistry and molecular biology as vital and relevant in the 21st century as it was in the 20th. Thank you for reading our journals and paying your dues and coming to our meetings. Thank you for upholding the high standards of our profession in all that you do. Thank you for the advice you gave me during my time in office — even when I didn't take it, I assure you I listened to it and I valued it. Thank you for writing to ASBMB Today and making its letter pages a vibrant source of debate. Thank you for your praise, your suggestions, your criticism, your complaints and your good wishes. I needed every bit of it. Most of all, thank you for caring. Don't ever stop. XXXX

For more information:

- A podcast interview with Gregory Petsko: www.asbmb.org/Interactive.aspx.
- A symposium celebrating the 30-year collaboration between Gregory Petsko and Dagmar Ringe: http://bit.ly/aJPETx.

FASEB Listed as Cancer Resource, Publishes New Article on Angiogenesis

BY CARRIE D. WOLINETZ

The Federation of American Societies for Experimental Biology recently has been listed as a resource on Cancer.net, a peer-reviewed, patient education website run by the American Society of Clinical Oncology. This listing is largely due to FASEB's Breakthroughs in Bioscience and Horizons in Bioscience series, both of which have addressed the development of treatments for a variety of cancers, including breast cancer and cervical cancer, as well as broad based oncology therapies, such as monoclonal antibodies. It is in this latter category that FASEB's most recent Breakthroughs in Bioscience article, "Life's Blood: Angiogenesis in Health and Disease," falls.

Pioneering scientist Judah Folkman strongly believed in angiogenesis as a unifying concept for developing new disease therapies, and this article details the centuries of vascular physiology research that led to Folkman's groundbreaking work showing the role of angiogenesis in tumor growth and development. These discoveries have led to an array of treatment options for diseases ranging from cancer to autoimmune disorders. "Life's Blood" describes both sides of the angiogenesis story: how inhibiting angiogenesis can prove pivotal in halting tumor growth and how promoting angiogenesis can be used to treat chronic wounds and diabetic ulcers.

From the first proposal in the early 17th century that blood circulated throughout the tissues under propulsion of the heart, scientists have been fascinated with the delicate network of vessels and capillaries that are integral to the maintenance of life and health in living creatures. Investigations in a variety of species allowed researchers to study the growth and proliferation of tiny capillaries and larger vessels in response to stimuli or tissue damage. As early as 1865, it was observed that tumors were filled with blood vessels. However, it wasn't until the latter half of the 20th century that Folkman and his colleagues postulated that tumor growth was dependent on the growth of new blood vessels, or angiogenesis. Interfere with that process, they theorized, and you could slow or stop the growth of cancerous tumors.

While initial scientific skepticism eventually gave way to sensationalized hype by the popular press, the fact remains that millions of patients now are treated with therapies based on inhibition or promotion of angiogenesis. More than a dozen drugs have been approved, including the blockbuster cancer drug, Avastin. Although it's not the "cure" for cancer that some headlines have proclaimed it to be, angiogenesis remains a promising area of research and development for tackling a host of diseases. FASEB's new Breakthroughs article tells the story behind the science of angiogenesis, including the roles of basic research, animal models and federal funding of life science research, at a level suitable for nonscientists. The article will be distributed, as are all of the articles in the series, to Congress, the media, educators and scientists. These articles are freely available on the FASEB website, and all FASEB society members are welcome to request free hardcopies for their own educational and advocacy purposes via that same website.

Carrie D. Wolinetz (cwolinetz@faseb.org) is director of scientific affairs and public relations for the Office of Public Affairs at FASEB.

For more information:

To get a copy of "Life's Blood: Angiogenesis in Health and Disease," go to http://bit.ly/cPfsXo.

America COMPETES Passes Committee

Some Republicans Try to Limit Science Spending

BY KYLE M. BROWN

On April 28, the House Science and Technology Committee passed the America COMPETES Reauthorization Act of 2010, a bill that re-examines and redefines the role of several key scientific agencies, including the National Science Foundation and the Department of Energy's Office of Science. But, even as the bill passed 29 to 8 with overwhelming bipartisan support, several Republican members offered amendments to reduce science spending.

"This bill is a big deal," said Chairman Bart Gordon, D-Tenn., in his opening remarks, characterizing the legislation as "an important step in our innovation agenda" affecting businesses and universities across the country.

The COMPETES bill would reauthorize the activities of the NSF, the National Institutes of Standards and Technology and the DOE Office of Science. If maintained, the recommended funding increases would double the budget of the NSF and the Office of Science over the next 10 years.

"The path is simple," Gordon said. "Research leads to innovation. Innovation leads to economic development and good paying jobs." Gordon said that over the past 20 years, the U.S. technology edge had slipped and that reversing that trend would require immediate additional investments.

But, several Republican members were concerned about the spending levels authorized in the bill.

U.S. Rep. Paul Broun, R-Ga., offered an amendment that would reduce spending and the length of the bill's authorization from five years to three.

"This is a common-sense amendment," Broun said. He emphasized that eliminating two years of authorization would help the committee to maintain better oversight of the programs outlined in the bill.

A few Republicans supported Broun's efforts. U.S. Rep. Mario Diaz-Balart, R-Fla., offered two of his own similar amendments to control spending.

"We're bankrupting our country," said Diaz-Balart. Referring to recent international fiscal crises, Diaz-Balart continued, "We don't want to be the next Greece or Argentina."

U.S. Rep. Ralph Hall, R-Texas, said he supported Diaz-Balart's amendment and applauded it for trimming more than $1 billion in authorized spending.

But, the committee rejected Broun and Diaz-Balart's arguments.

"This resolution undermines science," said U.S. Rep. Brian Baird, D-Wash., referring to Broun's amendment. Calling the amendment largely "specious," Baird said uncertainty about future science funding threatens long-term research projects.

Gordon highlighted his efforts to compromise with members who were reluctant to increase spending, saying that he had reduced the authorized spending levels by 10 percent from an earlier version of the bill.

Gordon also argued that shortening the number of years authorized in the bill actually would not save money because such amendments only delay decisions about how much should be spent in subsequent years.

Other Republican members supported Gordon's proposed spending levels.

"As a true conservative, we need to be investing in what's best for our children's future," said U.S. Rep. Roscoe Bartlett, R-Md.

"We are losing the technology battle," Bartlett continued. "If we had done this 20 years ago, we'd be competing better."

While Bartlett spoke favorably of the bill's scientific investment, he refused to vote against his fellow Republicans, instead voting "present" on Broun and Diaz-Balart's amendments.

U.S. Rep. Judy Biggert, R-Ill., spoke in support of Gordon's more robust funding proposal. She and U.S. Rep. Vernon Ehlers, R-Mich., voted with the majority of the committee against Broun and Diaz-Balart's amendments.

With the committee's approval, COMPETES moves to the U.S. House floor.

Kyle M. Brown (kmbrown@asbmb.org) is an ASBMB science policy fellow.

For more information:

- Read the text of America COMPETES, as well as remarks and press releases, at http://bit.ly/9l9Nze.
- For a section-by-section description of the bill, go to http://tinyurl.com/38x27df.
- Read Kyle M. Brown's Twitter feed on the hearing @kyle_m_brown (http://twitter.com/kyle_m_brown).

COMPETES Update: Porn Amendment BY KYLE M. BROWN

On May 13, as House Republicans sought to capitalize on public outrage against recent scandals at the U.S. Securities and Exchange Commission and the National Science Foundation, Democratic leaders removed the America COMPETES Act from the House floor after Republicans successfully attached a controversial amendment that slashed and eliminated authorized funding for several science agencies and programs.

"The Minority was willing to trade American jobs and our nation's economic competitiveness for the chance to run a good political ad," said House Science and Technology Committee Chairman Bart Gordon, D-Tenn. in a statement.

In addition to reducing science agency budgets and eliminating many new programs, the amendment, introduced by U.S. Rep. Ralph Hall, R-Texas, ranking member of the House Science and Technology Committee, barred funds authorized under COMPETES from paying the salary of any federal employee who had been disciplined for viewing pornography at work. The inspector general of the NSF recently identified several instances of NSF employees viewing pornography on the government's time.

"We're all opposed to federal employees watching pornography," but this amendment was about "gutting funding for our science agencies," Gordon said.

While Gordon hopes to bring COMPETES back up in the House, "the timing is unclear," he said.

ASBMB Staff Assists FASEB Hill Day BY PETER FARNHAM

American Society for Biochemistry and Molecular Biology public affairs staff members Peter Farnham and Kyle M. Brown spent May 5 on Capitol Hill, escorting ASBMB members serving on the Federation of American Societies for Experimental Biology board to meetings with various Congressmen and Senators.

In the Senate, ASBMB members Margaret K. Offerman (American Cancer Society, Atlanta, Ga.) and Louis B. Justement (University of Alabama at Birmingham) met with staff of both senators from their states (U.S. Sens. Jeff Sessions, R-Ala., Richard Shelby, R-Ala., Johnny Isakson, R-Ga., and Saxby Chambliss, R-Ga.) to discuss National Institutes of Health and National Science Foundation funding. The message delivered was clear: FASEB (and ASBMB) are advocating for $37 billion for NIH for 2011 and $7.7 billion for NSF. While the budget request for NSF approximately is in line with the Administration's request, the President has asked for only an additional $1 billion for NIH this year, approximately a 3.5 percent increase (which just meets biomedical inflation).

During the various discussions with Senate staff members, it was clear that they are well aware of the so-called "cliff" issue, which is shorthand for the problem of what happens to support for science at these two agencies when funding from the stimulus bill passed in the spring of 2009 expires at the end of fiscal year 2010.

NIH received an additional $10 billion over a two-year period under the stimulus bill, and this additional money generated more than 20,000 research proposals, only a small fraction of which were actually funded. However, thousands of jobs were created by the American Recovery and Reinvestment Act money, as scientists hired lab techs, bought small pieces of equipment, and otherwise put the money to good use. Nevertheless, it was made abundantly clear that we would be lucky to get the President's request for NIH, let alone an additional $5 billion.

The message we received overall was that this will be a very difficult year for funding, as most members of Congress are becoming worried about excessive federal spending; in addition, a continuing resolution to fund the government at current levels is likely — with an election coming up in November, no one in the democratic leadership wants their rank and file members to have to campaign while defending additional tough votes, particularly after passage of the health care bill.

A very unusual highlight of the day was when Sen. Sessions dropped into the meeting arranged for Justement. Sessions stayed for about twenty minutes and discussed the budget situation in some detail. It is quite unusual for senators to do this, as they have so many demands on their time.

ASBMB staff and members also visited U.S. Rep. John Lewis, D-Ga.; U.S. Sen. Richard J. Durbin, D-Ill.; U.S. Sen. Roland W. Burris, D-Ill.; U.S. Sen. Carl Levin, D-Mich.; and U.S. Rep. Jan Schakowsky, D-Ill.

Peter Farnham (pfarnham@asbmb.org) is director of public affairs at ASBMB.

Obey Retirement Shakes up Appropriations Committee, House

BY PETER FARNHAM

"I'm bone tired," said U.S. Rep. Dave Obey, D-Wis., in early May when he announced his retirement from the U.S. House of Representatives after serving since 1969. The Wisconsin democrat has been chairman of the U.S. House Appropriations Committee since the Democrats took control of the House in 2006 and also has served since then as chair of the Appropriations Subcommittee on Labor, Health and Human Services, Education and Related Agencies, which oversees the National Institutes of Health.

Obey has been viewed widely as a friend of the NIH, but the agency is not his only passion — for example, he also is very devoted to education issues. He once excoriated Federation of American Societies for Experimental Biology staff for too single-mindedly advocating for NIH funding over other social programs he considered equally important.

Obey received Research!America's public service award this past April. The award ceremony was most memorable for the musical duet he performed with NIH Director Francis Collins. Obey is an excellent harmonica player, and his performance with Collins (guitar, vocals) on a parody of "Summertime," made the evening particularly noteworthy, although a recording contract is not likely to be forthcoming.

Obey typically has won re-election by 60 percent or more during his 40 years of service. This year, he was facing Ashland County District Attorney Sean P. Duffy, who, according to Politico.com, was running "an uphill campaign" against Obey. However, other observers were not so sanguine; the New York Times characterized the race as likely the most competitive Obey had faced in years. (He and other senior democrats have been targeted by the GOP, and Duffy has been endorsed by former Alaska Governor Sarah Palin.) But, Obey strongly denied he was leaving because of his opponent, saying he had never walked away from a fight in his life.

Obey's departure, however, is a blow to House Democrats as they face political headwinds in a tough political year.

Obey's likely successor as Appropriations Committee chair is U.S. Rep. Norman Dicks, D-Wash. Dicks supposedly has made his wishes known to the Democratic leadership that he wants the job, and, barring something currently unknown, the job likely will be his next January, assuming the Democrats keep control of the House following the November elections. Dicks is from the 6th Congressional District of Washington, the northwest corner of the state. He is currently chairman of the Subcommittee on Interior, Environment and Related Agencies and also sits on the Subcommittee on Defense as well as the Subcommittee on Military Construction and Veterans Affairs.

Dicks is likely to bring a change of style to the chairmanship. Obey was respected widely but has a prickly streak and is, according to the Almanac of American Politics, not one to "suffer fools gladly." Dicks — while also respected for his long tenure and knowledge of the House as an institution (he was elected in 1976 after serving 10 years as a top aide to Senator Warren Magnuson) — also is well liked.

Dicks also is a strong supporter of the military. The Bremerton Naval Shipyard — the largest naval facility in the Pacific Northwest — is in his district, and he maintains the traditional strong support for Boeing. According to the Almanac, "he has a moderate voting record and has been considered more supportive of military spending and an interventionist foreign policy than most House democrats." Still, his ratings as a legislator are in the 90s from leftwing groups such as Americans for Democratic Action (90) and the American Civil Liberties Union (91), and in the low teens or single digits from rightwing groups such as the National Taxpayers Union (6) and the American Conservative Union (0). It seems clear from these rankings that no one is likely to mistake him for a blue dog democrat.

Assuming Dicks does not want to retain chairmanship of the L/HHS subcommittee, next in line for that job with Obey's departure would be U.S. Rep. Nita M. Lowey, D-N.Y. Lowey has been a member of the L/HHS subcommittee since the mid-90s and was elected to the House from White Plains in 1988. Another possible chair is U.S. Rep. Rosa L. DeLauro, D-Conn.

Peter Farnham (pfarnham@asbmb.org) is director of public affairs at ASBMB.

JBC Minireview Explores Another Scientific Intersection

BY NICK ZAGORSKI

Throughout its 105-year history, the Journal of Biological Chemistry has stayed true to its title and presented numerous papers that use chemistry to understand biological processes; in fact, articles that feature new chemical reagents or small molecule enzyme inhibitors generally are among the journal's most-cited papers.

Therefore, even though chemical biology — defined as the use of chemical tools and techniques to advance a molecular understanding of biology — has emerged as a unique discipline in the molecular life sciences, with its own set of journals and meetings, it finds itself highly intertwined with biological chemistry. In effect, these two disciplines need each other.

To highlight this perhaps inseparable connection, the JBC put out a new minireview series in April, titled "Chemical Biology Meets Biological Chemistry."

Coordinated by JBC Associate Editor Joel M. Gottesfeld and Benjamin F. Cravatt, this series features six minireviews that emphasize the importance of uniting synthetic chemistry with biochemistry in the study of complex biological processes. The minireviews highlight both the application of chemical techniques toward understanding life processes at the molecular level and the development of synthetic compounds either as tools for research or therapies for disease.

In the first minireview, Lori W. Lee and Anna K. Mapp describe the development of synthetic small molecules to control transcription in eukaryotic cells; one notable example mentioned is p53, whose misregulation is involved in half of all cancers, yet, the molecule still remains a bit of a mystery.

Next, Travis S. Young and Peter G. Schultz describe efforts to introduce non-natural amino acids into proteins, for example, residues with side chains that contain fluorophores, post-translational modifications, metal-binding ligands and photocross-linking reagents.

Champak Chatterjee and Tom W. Muir, meanwhile, describe techniques such as native chemical ligation and related synthetic methods used to generate histones with unique post-translational modifications to better probe chromatin structure and function.

In the fourth minireview, Gabriel M. Simon and Cravatt describe activity-based protein profiling, a technique in which reactive chemical probes are used to identify the targets of small molecule drugs, characterize members of enzymes families or screen for inhibitors.

Next, Kanak Raina and Craig M. Crews describe chemical alternatives to RNA interference to probe the function of selected proteins in living cells, for example sending specific proteins to the proteasome by targeted ubiquitination of the protein of interest. These methods might overcome RNAi limitations like off-target effects and difficulty in dealing with long-lived proteins.

In the final minireview, Maurizio Renna, Maria Jimenez-Sanchez, Sovan Sarkar and David C. Rubinsztein describe a related approach, using chemical inducing agents to promote the autophagy and clearance of protein aggregates that underlie neurodegenerative diseases — this could have tremendous therapeutic benefits.

These six minireviews may only provide a small sampling of the diverse field of chemical biology, but they certainly should convey the excitement surrounding this dynamic area and the great potential that chemical applications hold in solving important biological problems.

Look for future minireview series exploring cross-disciplinary topics, including a series on antibiotic synthesis and one on single-molecule studies. XXX

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

2010 Meeting Compendia

If you didn't get copies of the 2010 ASBMB Annual Meeting Compendia, you can still download them at www.jbc.org/site/meeting2010. Titles include "Initiating DNA Replication and Transcription," "Protein Synthesis," "Drug Discovery and Design," "Genomes, Proteomes and Development," "Nutrient Sensing & Signaling," "Lipids: On the Move" and "Building Protein Complexes."

asbmb member spotlight

Bond Named Evan Pugh Professor

American Society for Biochemistry and Molecular Biology Past-President Judith S. Bond, distinguished professor and chair of biochemistry and molecular biology at the Pennsylvania State University College of Medicine, has been named Evan Pugh Professor. She and two other Penn State faculty members, Donald C. Hambrick and Thomas Mallouk, join a list of 59 others given the title since its inception in 1960.

According to Penn State, the Evan Pugh professorships, named for the university's first president, are awarded to faculty members who are "nationally or internationally acknowledged leaders in their fields of research or creative activity; have demonstrated significant leadership in raising the standards of the university with respect to teaching, research or creativity and service and demonstrate excellent teaching skills with undergraduate and graduate students who subsequently have achieved distinction in their field." The professorships are the highest honor the university bestows on its faculty.

Bond's research focuses on the structure, function and regulation of proteolytic enzymes called meprins. Her work on wasting diabetic mice led to the discovery of meprins, a subunit of which recently has been identified as a susceptibility factor for inflammatory bowel disease.

Bond was president of ASBMB from 2004 to 2006 and is currently an associate editor of the Journal of Biological Chemistry.

Fedoroff Becomes AAAS President-Elect

Nina V. Fedoroff, science and technology adviser to the U.S. Secretary of State and the U.S. Agency for International Development has been elected to serve as the American Association for the Advancement of Science president in 2011.

Fedoroff, a geneticist and molecular biologist, is a pioneering researcher in the fields of plant genetics, plant responses to environmental stress and genetically modified crops. She has done fundamental research on the molecular biology of plant genes and transposons, as well on the mechanisms plants use to adapt to stressful environments. She published a book in 2004, titled "Mendel in the Kitchen: A Scientist's View of Genetically Modified Foods," which examines the scientific and societal issues surrounding the introduction of genetically modified crops.

Fedoroff is an Evan Pugh professor at The Pennsylvania State University, and, in 2003, she became a member of the external faculty of the Santa Fe Institute. She also was a speaker at the ASBMB annual meeting public affairs symposium in Anaheim this past April.

Farrell Honored with Dairy Science Award

Harold Farrell of the U.S. Department of Agriculture's Eastern Regional Research Center has been honored with the California Dairy Research Foundation's William C. Haines Dairy Science Award, in recognition of his contribution to the field of dairy science. Farrell, who works as an emeritus research chemist at the Dairy Processing and Products Research Unit at the USDA, received the award at the 12th Cal Poly Dairy Ingredients Symposium in March, where he also gave a presentation on the molecular basis for the structure-function relationships of casein.

Farrell said, "The majority of my scientific career has been spent in fundamental research on milk protein structure-function relationships. In this area, it sometimes is hard to see or predict a clear end point, but a new insight in itself always is exciting. Receiving the Haines Award, which covers a 20-year period, has made me feel as though it has been worth the effort. In essence, this award is a validation of the scientific process and is appreciated greatly."

Farrell's research focus has included a variety of programs related to the chemistry of the milk system and the biochemistry of the mammary gland.

Gerlt Receives Arthur C. Cope Scholar Award

John Gerlt, the Gutgsell Endowed professor of biochemistry at the University of Illinois at Urbana-Champaign School of Molecular and Cellular Biology, has been selected by the American Chemical Society as one of 10 national candidates to receive an Arthur C. Cope Scholar Award.

Gerlt received the award for his research leading to a deeper understanding of how enzymes accelerate a wide range of reactions and develop different mechanisms. His work has included pioneering studies of how enzymes, such as mandelate racemase, abstract protons from extremely weak acids to generate carbanion intermediates. Gerlt and co-workers also suggested that electrophilic catalysis and strong hydrogen bonding were key factors in making such difficult reactions proceed at reasonable rates. These studies have led to a better appreciation for the sophisticated tools enzymes can use to accelerate reactions.

Currently, Gerlt is studying two groups of enzymes that are derived from common ancestors, both of which share the ubiquitous $(\beta/\alpha)8$-barrel fold: the members of the enolase superfamily and the members of the orotidine 5'-monophosphate decarboxylase suprafamily.

PHOTO CREDIT: L. BRIAN STAUFFER, UNIVERSITY OF ILLINOIS, URBANA-CHAMPAIGN.

Gierasch Garners Dorothy Crowfoot Hodgkin Award

Lila M. Gierasch, professor of biochemistry and molecular biology at the University of Massachusetts, Amherst, will receive the Protein Society's 2010 Dorothy Crowfoot Hodgkin Award at the society's annual symposium in August.

According to the Protein Society, the award, sponsored by Genentech, is granted "in recognition of exceptional contributions in protein science, which profoundly influence our understanding of biology." Gierasch received the award in recognition of her exceptional contributions to the understanding of biology through the application of biophysical methods to interrogate biological systems.

Gierasch's research has had a major impact on fields spanning sequence-structure relationships, protein folding and aggregation, the pioneering application of novel biophysical analyses, (principally NMR), molecular recognition and cooperativity in molecular machines and protein secretion. Her most recent research focuses on the chaperone-mediated folding process, how a β-sheet "clam" protein is folded and how to monitor protein folding in a living cell and compare it with in vitro folding.

Orth Wins Award in Chemical Research

Kim Orth, associate professor of molecular biology at the University of Texas Southwestern Medical Center, was honored with the 2010 Norman Hackerman Award in Chemical Research for her pioneering work on the mechanisms bacteria use to cause disease.

The Welch Foundation, one of the nation's oldest and largest sources of private funding for basic research in chemistry, presents the annual award to honor up-and-coming scientists at Texas institutions. Recipients are recognized for expanding the frontiers of chemistry through their innovative research. First bestowed in 2002, the award pays tribute to the late Norman Hackerman, a noted scientist and longtime chairman of the foundation's scientific advisory board.

Orth has discovered new mechanisms by which invading bacteria hijack and deregulate a cell's signaling systems, cutting off the cell's ability to communicate with other immune-system cells that are needed to fight off disease. Her studies also have uncovered previously unknown mechanisms human cells use to carry out normal functions. For example, she discovered that an infectious ocean-dwelling bacterium found in oysters and other shellfish kills its host's cells by causing them to burst, providing the invader with a nutrient-rich meal that can then be used to fuel proliferation. The invading pathogen overtakes the host's autophagy machinery, a process that is usually tightly controlled.

Mahley Presented with Advocacy Award

Robert W. Mahley, president emeritus of The J. David Gladstone Institutes, has received Research!America's 2010 Builders of Science Award. According to Research!America, the award "recognizes his leadership as Gladstone's founding director and president, guiding its growth to become one of the world's foremost independent research institutions, known for its groundbreaking basic science and substantial impact on disease prevention."

In 1979, Mahley was recruited to lead the new Gladstone Institute of Cardiovascular Disease. He was instrumental in the creation of the Gladstone Institute of Virology and Immunology in 1992 and the Gladstone Institute of Neurological Disease in 1998. In 2004, Mahley led the institutes' move to a new, state-of-the-art home at the University of California, San Francisco's Mission Bay campus, enhancing Gladstone's collaborative, entrepreneurial culture by bringing all three institutes into one building.

Mahley stepped down as Gladstone's president this past March. He continues to do research on apolipoprotein (apo) E and its role in heart disease, Alzheimer's disease and neurodegeneration. His studies have led to an understanding of the mechanisms by which apoE causes Alzheimer's disease and other neurodegenerative disorders. Mahley also is a professor of pathology and medicine at the University of California, San Francisco.

IN MEMORIAM:

Roy L. Whistler

Roy L. Whistler, emeritus Hillenbrand distinguished professor of biochemistry at Purdue University, died Feb. 7.

Whistler was born in 1912, in Tiffin, Ohio. He attended Heidelberg College, where he received his Bachelor of Science, The Ohio State University, where he earned his Master of Science and Iowa State University, where he received his doctoral degree. He began his professional career at the U.S. National Bureau of Standards (1938 – 1940), then became Head of the Starch Structure Group of the United States Department of Agriculture Northern Regional Research Laboratory at Peoria, Ill. (1940–1945), before coming to Purdue University.

Whistler contributed to many aspects of carbohydrate chemistry but was best known for his pioneering research on polysaccharides and for promoting their industrial application. For example, he foresaw the industrial potential of the guar plant, promoted it as a new commercial crop, determined the structure of the main constituent of guar gum and was instrumental in the development of the guar gum industry. He also perceived the industrial potential of starch amylase, and, with H. H. Kramer, a corn geneticist at Purdue, developed the first high-amylose corn, also now a valuable commercial crop.

The Roy L. Whistler Award of the International Carbohydrate Organization and the Whistler Center for Carbohydrate Research at Purdue University are named in his honor.

ASBMB Members Receive Academy Honors

BY NICOLE KRESGE

This past spring, six American Society for Biochemistry and Molecular Biology members were elected to the National Academy of Sciences and eight were elected to the American Academy of Arts and Sciences.

Vann Bennett, Mina J. Bissell, James E. Haber, Lynn M. Riddiford, Kevin Struhl and Zena Werb were honored with election to the National Academy of Sciences. They are among the academy's 72 new members and 18 foreign associates selected in recognition of their distinguished and continuing achievements in original research. This brings the total number of active academy members to 2,097.

The National Academy of Sciences is a private organization of scientists and engineers dedicated to the furthering of science and its use for the general welfare. It was established in 1863 by a congressional act of incorporation signed by Abraham Lincoln that calls on the Academy to act as an official adviser to the federal government, upon request, in any matter of science or technology.

Samuel Herbert Barondes, Thomas Blumenthal, Sunney I. Chan, G. Marius Clore, Benjamin D. Hall, Timothy James Ley, Roy R. Parker and Thomas Christian Südhof were among the 229 leaders in the sciences, social sciences, the humanities, the arts, business and public affairs who were elected as members of the American Academy of Arts and Sciences. These new fellows join one of the nation's oldest and most prestigious honorary societies.

Established in 1780 by John Adams and other founders of the nation, the American Academy of Arts and Sciences undertakes studies of complex and emerging problems. Current projects focus on science and technology; global security; social policy and American institutions; the humanities and culture and education.

Samuel Herbert Barondes is the Jeanne and Sanford Robertson professor of neurobiology and psychiatry as well as director of the Center for Neurobiology and Psychiatry at the University of California, San Francisco.

Vann Bennett is a Howard Hughes Medical Institute investigator and James B. Duke professor of cell biology in the departments of cell biology, biochemistry and neurobiology at Duke University Medical Center in Durham, N.C.

Mina J. Bissell is a distinguished scientist in the life sciences division at E. O. Lawrence Berkeley National Laboratory in Berkeley, Calif.

Thomas Blumenthal is professor and chairman of the department of molecular, cellular and developmental biology at the University of Colorado.

Sunney I. Chan is the George Grant Hoag professor emeritus of biophysical chemistry at the California Institute of Technology.

G. Marius Clore is chief of the protein nuclear magnetic resonance section at the Laboratory of Chemical Physics, National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health.

James E. Haber is the Abraham and Etta Goodman chair of biology and director of the Rosenstiel Basic Medical Sciences Research Center at Brandeis University in Waltham, Mass.

Benjamin D. Hall is a professor emeritus of biology and genome sciences at the University of Washington.

Timothy James Ley is the Alan and Edith Wolff professor of medicine as well as professor of genetics and director of the stem cell biology section in the division of oncology at the Washington University in St. Louis School of Medicine.

Roy R. Parker is a regents professor at the University of Arizona/Howard Hughes Medical Institute.

Lynn M. Riddiford is a senior fellow at the Howard Hughes Medical Institute Janelia Farm Research Campus in Ashburn, Va.

Kevin Struhl is the David Wesley Gaiser professor in the department of biological chemistry and molecular pharmacology at Harvard Medical School in Boston.

Thomas Christian Südhof is the Avram Goldstein professor of molecular and cellular physiology at the Stanford University School of Medicine/Howard Hughes Medical Institute.

Zena Werb is professor and vice chair of the department of anatomy in the School of Medicine at the University of California, San Francisco.

Nicole Kresge (nkresge@asbmb.org) is the editor of ASBMB Today.

Science Music Videos: Creative Tools for Teaching Science

BY NANCY VAN PROOYEN

Hip-hop music echoes down the halls at Stanford University. But, if you listen closely, the lyrics are not about money and violence — they are about DNA and electrons. Tom McFadden, an instructor in the human biology program, creatively blends hip-hop with science to explain concepts from evolution to cellular respiration.

Geeky videos about science have been around for a long time. Who can forget the 1971 video of Stanford students depicting ribosomal translation through interpretive dance? Given the low numbers of students interested in pursuing scientific careers, it is obvious that we need ways to kindle scientific interest in young minds. Media and politics constantly bombard us with the message that science is uncool. Rather than emphasizing the power of science, schools focus on memorizing the details and mechanics. Although understanding the basics is important, we need to put the excitement front and center.

McFadden has been spinning his hip-hop parodies on biology since high school. These videos are catchy, funny and always educational. For instance, "Regulatin' Genes" parodies Jay-Z's "Money Ain't a Thang" and depicts the complicated world of gene regulation. The science behind the rap lyrics explains that all cells contain the same genetic information, but cell specialization occurs when transcription factors turn genes on and off.

Recently, McFadden created a video called "Oxidate It or Love It/Electron to the Next One," which is a parody of 50 Cent's "Hate It or Love It" and Jay-Z's "On to the Next One." The video explains how glucose is converted into energy or ATP through glycolysis and the Krebs cycle. Normally, bringing up oxidative phosphorylation is an instant buzzkill. McFadden explains, "My goal is to convince students that biology is worth studying because it is so inherently fascinating and relevant to their everyday lives and that a deep conceptual understanding will make the details far easier to remember."

So who's the target audience for these videos? High school, pre-med and biology/biochemistry students would appreciate them the most because they often are required to know these topics in great detail. "High school teachers face a great challenge in motivating students; with that group, the best methods involve shocking and surprising them, and biology raps definitely serve that purpose," says McFadden. Additionally, hip-hop aficionados who are curious about cutting-edge basic science or the workings of exciting technologies would find these easily digestible.

Tom McFadden blends hip-hop with science to explain concepts ranging from evolution to cellular respiration.
PHOTO CREDIT: CARLOS SELIGO.

Next, McFadden is creating a new rap song about how short-term stress can be good and how chronic stress can really mess you up, to the tune of "Hey Ma" by Cam'ron. McFadden plans to take his rhyme skills into the classrooms and teach kids to write their own scientific rap songs. "This project will culminate at [the New Zealand International Science Festival], where we will be having a 'Science Idol' competition, where students will compete to be the next great science rap star," says McFadden.

Now that it's easy to shoot and post videos on YouTube for the world at large to consume, one only can hope that other students and budding scientists will be inspired to translate their scientific passion in similar ways.

Nancy Van Prooyen (vanprooyennm@mail.nih.gov) is a postdoctoral fellow at the National Cancer Institute.

To see these and other science music videos, go to the online version of this article at http://bit.ly/9NW5Jg.

Almost Science, Always Art

BY LESLIE W. CHINN

Alan Rorie is a neuroscientist by training. These days, however, you're more likely to find him using an MIG (metal-inert gas) welder to send sparks skimming over a cool slab of metal than peering at glowing monkey neurons through a microscope.

From Neurons to the Neuron Chamber

Not too many years ago, Rorie was a graduate student at Stanford University, investigating the amalgamation of different types of information in the cortexes of macaques during the decision-making process.

Now, Rorie amalgamates metals (and sometimes other materials) into works of art in a process that he calls "almost scientific." This is also the name of the science and art collaborative that Rorie founded, as well as the name of his website, almostscientific.com. The goal of Almost Scientific, the collaborative, is to "educate scientists about art and artists about science" through the creation of art pieces that tend to be quite large, with moving parts.

Rorie always has been intrigued by moving parts — as a child, he says he was "really interested in taking stereos and blenders apart and putting them back together." He also loved to read and write stories, which eventually led him to study the humanities in college. But, Rorie began to feel that the true source of being able to understand and appreciate the humanities was rooted biologically, in the brain. "What makes a great painting or symphony really has to do with how you perceive it," says Rorie, "so I became very interested in the neuroscience of perception."

By the time Rorie discovered that neuroscience wasn't yet able to explain how the brain experiences art, he had nonetheless become intrigued. "I was already hooked on just understanding the brain and how it works," he remembers. To this end, Rorie did a stint at the National Institute of Mental Health, then moved to California for graduate school.

Slowly, however, Rorie began to see that his future was not at the bench. It took a while for him to decide that he wanted to focus on, as he puts it, "art and creative pursuits." Arriving at this conclusion wasn't easy, particularly because everyone, including himself, thought of Rorie as a scientist.

The Process of Creation

In his studio in West Oakland, Calif., Rorie creates works with fantastical names: the Raygun Gothic Rocketship, the Triaparator and the Neuron Chamber. This last work is an "electro-kinetic sculpture" that demonstrates what neurons are and what they do. And, yes, it uses electricity: 9,000 volts make for an impressive action potential as they arc, a blinding blue light, down axons made of metal.

Rorie not only is interested in teaching nonscientists about neurons — he also would like them to understand the mechanical workings of the Neuron Chamber. "In the sense [that] I can teach either the scientific content of my sculpture or the physical mechanics of it," he says, "I am happy to do that."

Rorie appears to derive a great deal of satisfaction from the design and construction of his work. Because many of his pieces are large and have moving parts, he makes use of engineering techniques — for example, CAD (computer-aided design) programs during the planning process — as well as tools intended for more industrial purposes, such as the MIG welder.

"A lot of the really large-scale pieces that I work on require a tremendous amount of engineering," says Rorie, "and that is a huge part of the challenge and the fun and the beauty of these pieces." He seems to revel in the process of creation, or as he puts it, "figuring out how to take something crazy and make it real." This also is part of the message of Rorie's works — to inspire people with the way he has taken a material as strong and rigid as metal and molded it to represent something as delicate as a human neuron.

As in science experiments, meticulous planning in art only goes so far. Nothing ever comes out the way you

The Neuron Chamber — an "electro-kinetic sculpture" that demonstrates what neurons are and what they do. To see a video of the Neuron Chamber in action, go to http://bit.ly/9WXy4l.

planned it, Rorie says, so you always have to be ready to adapt to the reality of the work. "At a certain point, you stop telling the work what it's going to be," he explains, "and it starts telling you what it is." But, unlike many scientists, for whom the ultimate thrill is seeing their work published, the excitement is over for Rorie once a piece is done. "It's more the process that's important to me — it's more the thrill of doing than the thrill the final product brings."

Action, Reaction

Science and art may seem to exist in separate spheres, but Rorie believes that ultimately, they're both about communication. It's the direction in which the two are communicating that's different, much like a reaction that can run in two different directions. The way Rorie sees it, scientists generate conceptual abstractions to explain physical phenomena, whereas artists generate physical embodiments of their abstract ideas, thoughts or knowledge. The Neuron Chamber was an experiment in this concept for Rorie: He wanted to take his knowledge of neuroscience and communicate it via a sculpture of "high-voltage, robotic neurons in an alien observation tank."

So, was the experiment successful? Paul Doherty, founding director of the Center for Teaching and Learning at the Exploratorium in San Francisco, thinks so. He watched people interact with Rorie's Neuron Chamber while it was installed at the museum. "As the visitors figured out what was happening, they could predict aloud what the spark would do next, then laugh if they were correct, or moan if they were not," Doherty recalls. "[They] had been drawn into the world of sparks and neuron modeling."

Rorie often creates pieces that move, light up, or spew sparks or steam. He does this not only because he enjoys the engineering challenge but also because it makes the art more "alive." Kinetic art has "action and reaction to the world around it," Rorie says. "It gets touched and moved; it wears down." In a way, the moveable aspect of Rorie's art is a continuation of the bidirectional communication experiment. Moving parts encourage people to interact with the art, which means that Rorie's pieces sometimes wear out or break. He doesn't mind — in fact, he likes to fix them because it gives him something to do at gallery shows.

"The Path Is That Simple"

For bench scientists who yearn for the freedom of arc welding, Rorie has this advice: find something you love and do it, and soon you'll get to *be* it. He expands upon this in two parts. The first is that there isn't necessarily a formal process for every step of one's career. "You don't need to apply," he says. "If you want be a carpenter, you just go and be a carpenter. The path is that simple."

The most difficult step may be overcoming one's self-identification as a scientist, as it was for Rorie. So here's the second part of his advice, which is more of a pep talk for those who don't view proficiency with a confocal microscope as a skill that can be translated to another line of work: "Your education as a scientist is deeper and stronger than just the field in which you work." Rorie notes that while he doesn't do science anymore, he uses the skills that he learned as a graduate student every day.

Besides, says Rorie, as a scientist, "you are on the cutting edge of knowledge — so why can't you do anything else that you imagine doing?"

Leslie W. Chinn is a postdoctoral fellow at the National Cancer Institute.

The Johns Hopkins Institute for NanoBioTechnology: Small in Science, but Not in Scope

BY NICK ZAGORSKI

Many universities have been creating multidisciplinary research institutes over the past several years in a reflection of the more collaborative nature of science. Typically, the stories are similar in origin; perhaps a new building, some specialized resources, a directed research vision and, of course, a select group of top-level faculty members who can push that vision forward — in part, by providing a level of prestige that can draw in the lifeblood of research: funding and students.

But, what if this traditional model was turned on its head? Thanks to some forward-thinking scientists at The Johns Hopkins University in Baltimore, we have an answer: the Institute for NanoBioTechnology.

Launched in May 2006, the INBT employs the emerging field of nanotechnology, which manipulates matter at the molecular, or even atomic, levels to design new materials and devices, to both answer fundamental questions about cell behavior and to develop new advances in biomedicine.

At first glance, it may seem like ordinary fare, but a closer inspection reveals that INBT follows its own path.

"If you look past the surface of a typical university-based multidisciplinary research center, you often find that the institute is self-contained and doesn't spill over to the surrounding academic community at large," explains Peter C. Searson, the Joseph R. and Lynn C. Reynolds professor of materials science and engineering at Johns Hopkins and director of INBT.

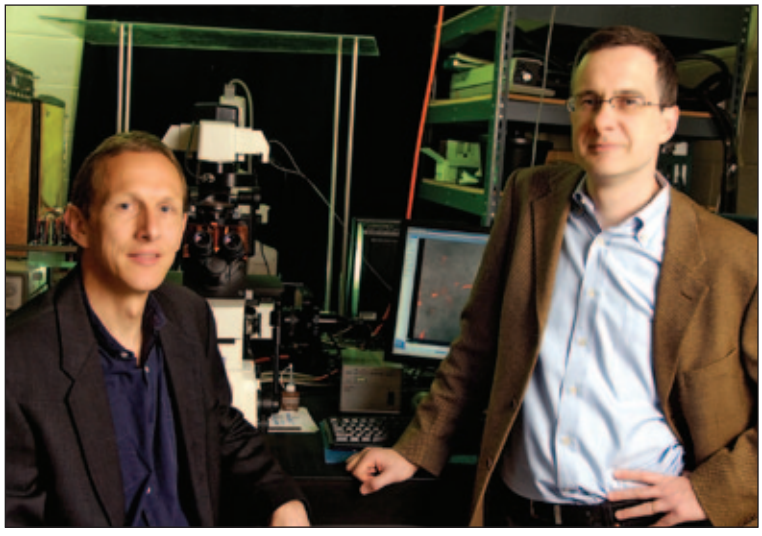
INBT's Associate Director Denis Wirtz, the Theophilus Halley Smoot professor of chemical and biomolecular engineering, completes the thought: "In essence, a traditional research institute is kind of like an exclusive club. The INBT at Hopkins, in comparison, is exactly the opposite; it was designed to be an inclusive club."

The numbers back that up; just four years after INBT's launch, the institute has grown to include 212 affiliated members from across the vast Johns Hopkins community. Members hail from the School of Medicine, the Bloomberg School of Public Health, the Krieger School of Arts and Sciences, the Whiting School of Engineering and even the Applied Physics Laboratory.

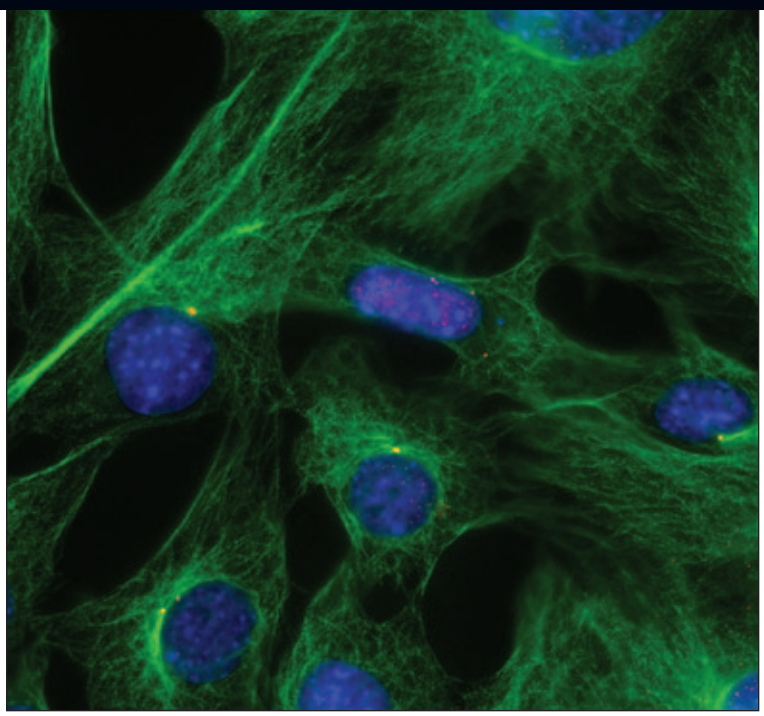
And, INBT still will welcome more, for it's as much a social network as a science institute; its purpose is to help Hopkins researchers interested in pursuing nanotechnology find partners or resources for their research, be it biologists who are looking for engineering tools to answer their questions or engineers seeking biological problems for their technology.

This is a vital resource, because, as scientific disciplines go, nanotechnology is a truly integrative field. It may deal with matter at the smallest scale, but the functional interface between biology, chemistry, physics and engineering is immense.

"Think about all the scientific expertise required to develop gold nanoparticles that can deliver targeted drugs to a tumor," says Wirtz, citing a common nanotech application. "You need clinical researchers who understand tumor physiology, colloid and interface scientists who can design particles that will work in the bloodstream, molecular biolo-



Johns Hopkins Institute for NanoBioTechnology Director Peter C. Searson (on left) and Associate Director Denis Wirtz. PHOTO CREDIT: WILL KIRK.



Denis Wirtz's group has been using a variety of biological and engineering techniques to study the factors affecting the movement and positioning of the microtubule organizing center relative to the cell center.

gists to perform in vitro studies, imaging experts to track the particles in vivo and toxicologists who can ascertain if the nanoparticles will be poisonous, just to name a few."

INBT accomplishes its mission of bringing together interested nanoscientists through a variety of efforts. Its website (http://inbt.jhu.edu) serves as a welcome center and community portal, providing a list of INBT affiliates and their research interests, relevant funding opportunities, a repository of nanotechnology tools that Hopkins researchers have developed and even an online grant submission assistant.

INBT also hosts an annual symposium on campus that highlights emerging areas of nanotechnology research in health and biology, another networking and educational opportunity that Searson notes is one of the most highly attended scientific events at the university.

The institute even runs annual competitions for pilot project programs, awarding seed money to teams of two or more faculty that propose research ideas spanning the biology-physical science interface.

"These awards are great because, in today's funding environment, especially when dealing with novel and untested techniques, a good idea is simply not enough," notes American Society for Biochemistry and Molecular Biology member Pamela Zeitlin, a professor of pediatrics at Hopkins who has been one of many clinicians to join up with the INBT. "These days, you need some proof of the principle, and these small seed grants help researchers get that invaluable preliminary data to support larger grants."

Last year, Zeitlin, who studies the molecular and genetic underpinnings of cystic fibrosis, teamed up with colleague Neeraj Vij and received a project award to study the potential of inhaled nanoparticles to deliver cystic fibrosis drugs directly to the lungs and avoid potential systemic side effects.

As Searson explains, "Hopkins is an ideal institution for researchers who want to explore nanotechnology in biomedicine, and INBT strives to do the utmost to lower the barrier to entry and encourage them to make that effort."

Starting Small

In fitting with the nontraditional and inclusive nature of INBT, the origin of this institute is quite unusual as well. It wasn't a grand design unveiled at the presidential-level, a large philanthropic donation or some other top-down development that led to INBT's formation. Rather, the vision for this integrative center was a grassroots effort, originating with a small group of researchers who saw an opportunity to connect many of Hopkins' academic strengths.

The genesis occurred in 2004, when Searson and Wirtz began having informal conversations about some interesting areas where they could expand their research. "And about that time, the National Institutes of Health was discussing nanomedicine as part of their roadmap, and we both agreed that biomedical innovations, particularly in drug delivery and medical imaging, would be significant outlets for nanotechnology," Searson says. "And Hopkins, which is synonymous with outstanding medical research at both the basic and clinical levels, would provide no shortage of connections for that outlet."

"But, we decided we wanted something more than just us knocking on some biologists' doors looking for collaborative projects," he continues. "We began wondering, how could we make a nanobiology initiative happen on a large scale?"

So, Searson and Wirtz gathered up some other like-minded colleagues, such as ASBMB member Peter N. Devreotes in Hopkins' department of cell biology.

"I thought the idea Peter and Denis presented was wonderful, though not necessarily because of the nanotechnology angle," says Devreotes, who serves as part of the INBT executive committee. "After all, molecular biologists have been working at the 'nano' scale for more than 30 years."

"However, our biology faculty has this tremendous resource in the outstanding engineering programs at Hopkins, and developing fruitful collaborations between the two groups would really help us advance basic biomedical knowledge, particularly in getting more quantitative information."

Over the next two years, the INBT initiative slowly moved up the academic ladder, eventually reaching the level of Hopkins' president and deans, whom they then managed to convince that setting up a nanobiotechnology institute was worthwhile.

And, four years later, the numbers have rewarded that decision. Not only have more than 200 researchers signed on to this undertaking, including many of this university's most accomplished members, but INBT also already has generated more than $44 million in federal funding, almost triple the expected amount, given the number of submissions.

Among these many grants is the 5-year/$14.8 million award for the Johns Hopkins Engineering in Oncology Center, launched last October as one of the dozen new National Cancer Institute-sponsored Physical Sciences-Oncology Centers, an initiative aimed at pursuing a new avenue of cancer research by studying the physical laws and properties of this disease.

"The award for the EOC exemplifies how having a coordinated institute has helped Johns Hopkins as a whole," says Searson. "Denis foresaw that new approaches for cancer could be a big NIH focus in the future, so we helped pave the way for that in some of the projects we supported and in making nanotechnology for cancer the focus of our symposium in 2008."

"We try to anticipate funding trends," adds Wirtz, "so, by the time we need to make proposals, we already have teams of scientists with experience in that field, as well as a proven record of working together and training students together, so we set up an unbeatable proposal."

As to where INBT might make its next major impact, Searson notes that discussions are already underway for future initiatives, although he notes, with a smile, that they are "top secret."

However, he directs all curious individuals to the annual NanoBio symposium. "Remember, we focused on cancer in our 2008 symposium and soon thereafter developed our EOC proposal," he says. "So, if you want some clue as to areas we think are important, well, neurobiology was the topic of the 2009 symposium, and just last month, we hosted our 2010 symposium on nanotechnology in public health and the environment."

As for other future plans, INBT actively is looking at increasing corporate and industry partnerships, a vital link considering the commercial potential of nanotechnology and also preparing for a new 18,000-square-foot headquarters on the Homewood campus. For, while INBT remains a bit nontraditional as research institutes go, Searson and Wirtz acknowledge that it cannot be completely virtual, and a centralized location is important to provide physical interactions, especially among students, that can boost collaboration.

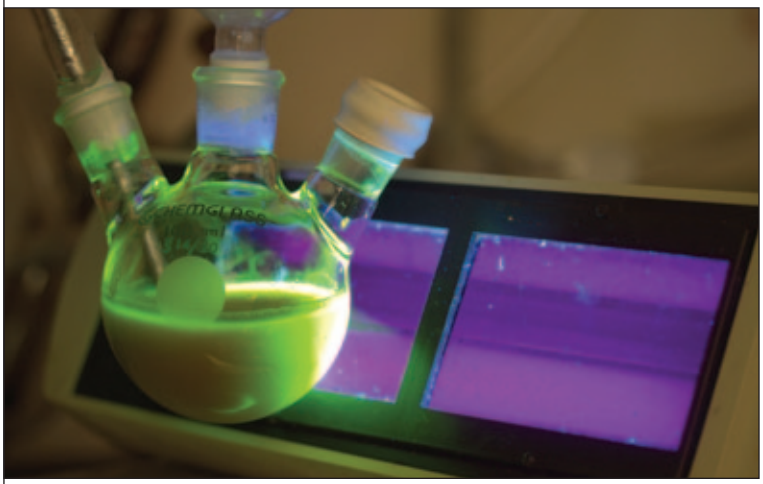
Starting Young

But, although this future campus space will provide a central hub for the university-wide INBT, the real glue that holds this institute together is its student and postdoctoral workforce — and not just because they do all of the grunt work.

"The students have been instrumental to our success because they play the matchmaker," Wirtz notes. "They develop the ideas for cross-disciplinary projects that help bring faculty together."

For example, Wirtz, who employs particle-tracking technology to study cytoskeleton activity and cell movement, recently had a student propose an idea to use these tracking techniques to monitor viral entry into cells. Knowing very little about viral behavior, Wirtz was nervous about the many potential experimental pitfalls. "But, over at the medical school, we have Robert Siciliano, one of the foremost experts on HIV, so I encouraged my student to talk to him, and soon we had set up a joint effort." Searson and Devreotes, meanwhile, recently have set up their own joint effort to develop a universal method of tagging cell surface receptors using quantum dot technology.

That's why training initiatives have been a vital component of INBT's mission. Beyond simply developing better nanobiotechnology tools, they want to create a new breed of scientists and engineers who



Peter C. Searson's lab has been developing cadmium selenide quantum dots (specialized nanoscale semiconductors, pictured here fluorescing under UV light) to visualize and track a variety of molecular processes.
PHOTO BY RICH FOLKERS AT NCI.

speak a common language, and who would be equally adept at publishing in both biological and engineering journals.

"We're not talking about an engineer who publishes an article with some biological applications in an engineering journal," Searson says. "We're talking about an engineer who can publish a paper in a top-level biology journal, who can really pass a rigorous peer review of experts."

To accomplish this, INBT has initiated programs for trainees at all levels, including postdoctoral fellowships in nanotechnology for cancer medicine and summer research opportunities for undergraduates.

A core element, though, is the National Science Foundation-funded IGERT (integrative graduate education and research traineeship) fellowship program. The IGERT program brings together about 6-10 incoming graduate students of various backgrounds each year, and, starting with a 1-week boot camp where senior IGERT fellows provide a crash course on basic principles and techniques in both life sciences and engineering, they undertake classes and seminars to prepare them for multidisciplinary, nanotechnology research; the program includes an open-ended lab course where the students design and develop their own nanoprobes, with the students and advisors working together to tailor the project to the interests of the group.

Afterwards, IGERT fellows are strongly encouraged to find a secondary adviser in a different field to help them become more well-rounded. This co-advising is more than a token effort; the students have lab space and lab responsibilities, such as giving group meetings, for both of their mentors. However, by the time the fellows have completed their requirements, they have learned how to work with people of different backgrounds, developed important skills in critical thinking, gained solid knowledge in a complementary discipline and have developed a strong network of colleagues that, hopefully, lasts beyond Hopkins.

"It definitely has required a little extra work on my part, but it certainly has been worth it," notes IGERT fellow Laura Dickinson, a student in Sharon Gerecht's group in the chemical and biomolecular engineering department who studies how various stem cells reprogram and repattern to form functional blood vessels. "I think I've gained a better understanding of difficult concepts like surface patterning and quantum dots, and it's been great meeting students from other disciplines who I can call on for help in case I need it."

"I think in the near future, such cross-disciplinary training will become commonplace," Searson says, "and we'll look back and wonder how we ever taught students before."

But, it's not just the students who are breaking down traditional walls.

Searson notes he's had numerous scientists from around the world talk to him and question how INBT, with so many joint initiatives, handles tricky issues like co-authorship or assigning principal investigators. "And, I tell them it never has been a problem; our members understand the stakes and the great potential of the INBT and are willing to put aside some of their own individual gains."

Because, sometimes, you just have to break with tradition.

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

NRC Publishes Report on Multidisciplinary Research

The term "multidisciplinary science" constantly is evolving — after all, it wasn't that long ago when merging the fields of biology and chemistry seemed like a radical concept, whereas today, its common to see scientists who equally are well-versed in genetics, biochemistry and cell biology.

However, as the 21st century marches on, another seemingly radical merger is taking shape as the physical sciences become more prevalent in biology. True, some fields like structural biology have employed principles from physics for many years, but now, scientists from many other traditionally "descriptive" biology fields have been heading towards this life sciences-physical sciences interface. This can be seen from the individual lab to whole universities, such as the Johns Hopkins Institute for NanoBioTechnology highlighted here.

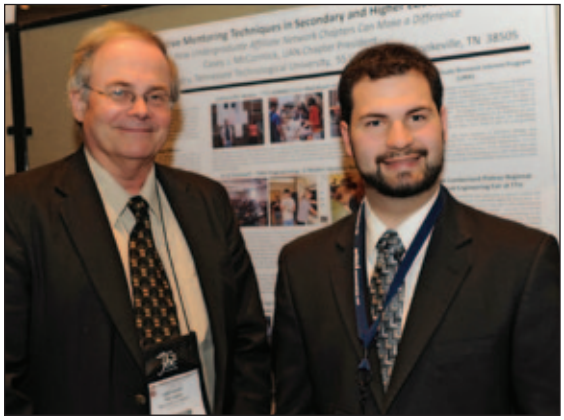
Recently, the National Research Council has shed more light on this growing convergence through the publication of their report, "Research at the Intersection of the Physical and Life Sciences." Prepared by a committee which included American Society for Biochemistry and Molecular Biology President Gregory Petsko, this report presents three main objectives: 1) to provide a framework for understanding the goals of intersection science and why it is worthy of attention from both scientists and funding agencies; 2) to assess current efforts at combining physical and life sciences and suggest some promising opportunities for future efforts; and 3) to set out strategies to enhance collaboration so that researchers can take full advantage of the opportunities at this intersection.

The report is worth a read by any scientist who currently is, or is considering, carrying out work at the physics-biology interface. As a special offer, ASBMB Today readers will receive a 25 percent discount when they order this report at http://bit.ly/ach5C4. To take advantage of the special offer, use the discount code "SASBMB" when you enter your payment information during the purchase process.

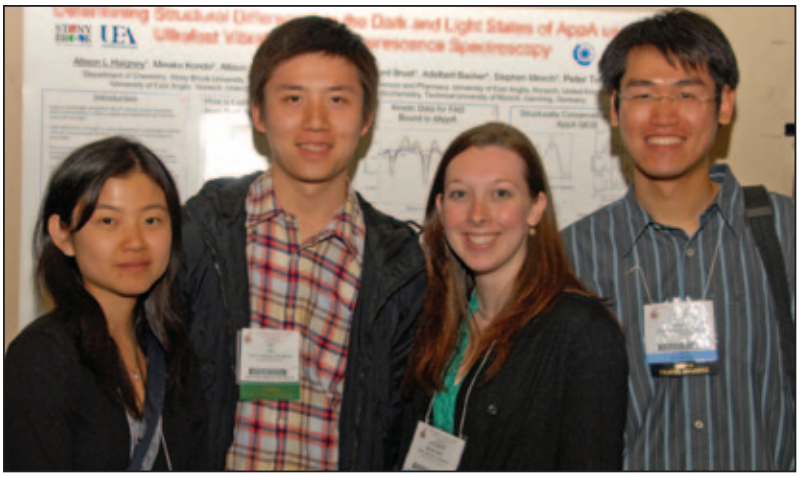
Also, be sure to check out this month's special ASBMB Today companion podcast with Petsko as he discusses, among other topics, the NRC report (www.asbmb.org/Interactive.aspx).

Scenes from the 2010 ASBMB Annual Meeting

(Photos clockwise from above) Graham C. Walker of the Massachusetts Institute of Technology gives advice in the graduate/postdoctoral travel award keynote lecture. FASEB Excellence in Science Award recipient Susan S. Taylor talks about the dynamics of PKA signaling. Colin Erovick and Kelsey Jeletz of the Cedarburg High School in Wisconsin explain their research using a molecular model. Fun run participants Ryosei Sakai (from left), Eric Hanse, Hisamine Kobayashi and Marcela Vergara-Jim get off to a fast start.



Above top, Federation of American Societies for Experimental Biology Executive Director Guy Fogleman (from left), FASEB President-elect William Talman and ASBMB President-elect Suzanne Pfeffer chat at a reception. Above, ASBMB President Gregory Petsko visits Tennessee Technological University undergraduate student Casey J. McCormick's poster on mentoring techniques. (Photo below) Wande Li of the Boston University School of Medicine gets encouragement from his postdoctoral fellow Yinzhi Zhao before the 5K fun run.



Above, Nina Liu (from left), Li Liu, Allison Haigney and Pan Pan of Stony Brook University pose in front of Haigney's poster at the graduate/postdoctoral poster session. Undergraduate student research poster competition winners Michael Jungwirth of the University of Tennessee and Laura Sloofman of the University of Delaware pose with their awards, above right.

(Photos clockwise from above) Lutheran High School of San Diego students Sarah Lee (from left), Landon Akers, Wednesday Bushong and Karlene Akers take a break from the undergraduate poster session. Journal of Biological Chemistry Associate Editor Kenneth Neet poses with JBC Editor Herbert Tabor in their JBC t-shirts. Past-ASBMB President Bettie Sue Masters chats with JBC Associate Editor Norma Allewell. Avanti Young Investigator Award in Lipid Research recipient Sarah L. Keller of the University of Washington gives an award lecture. ASBMB travel awardees Mack Hall, III of Meharry Medical College and Jeanelle Spencer of Johns Hopkins University School of Medicine network at a thematic reception.

Want to see more from the 2010 annual meeting? Go to www.asbmb.org/asbmbtoday, where you'll find pictures, videos, lists of our fun run & poster award winners & more.

A Capitol Event—ASBMB 2011 in Washington, D.C.

BY KUAN-TEH JEANG AND DANIEL M. RABEN

Washington, D.C., is the place to be from April 9 to 13, 2011. During that time, you will be able to attend the American Society for Biochemistry and Molecular Biology's annual meeting, held in conjunction with Experimental Biology 2011, as well as the National Cherry Blossom Festival. The ASBMB meeting will offer a comprehensive and stimulating menu of cutting edge science, technology and new educational approaches. We also have a new format — award lectures and exceptional plenary lectures will be placed in time slots that do not conflict with other scientific presentations.

Ten Outstanding Symposia

The meeting's 10 scientific symposia will highlight the interests of ASBMB members and also focus on exciting emerging topics that have not been presented at recent meetings. The symposia themes, presented below, cover evolving concepts in protein biochemistry, lipid biochemistry, carbohydrate metabolism and nucleic acid biochemistry. Four thematic symposia will be presented each day of the meeting. Each symposium will include invited speakers as well as short talks chosen from submitted abstracts. Posters related to the symposium topic also will be presented on the day of the symposium.

A subject that has garnered increasing attention in the scientific community is the regulation of protein synthesis and degradation. This topic has implications for a number of research areas, including stress responses and autophagy. Ivan Dikic (Goethe University Medical School) and Ramanujan S. Hegde (National Institutes of Health) will organize a theme addressing this area, titled **"Protein Synthesis and Degradation."** The symposium will cover four subtopics: novel aspects of protein translation; membrane protein biosynthesis; protein folding and quality control and protein aggregation and autophagy.

Over the past 30 years, lipid metabolism has emerged as a central theme in biochemistry. Vytas Bankaitis (University of North Carolina School of Medicine) and Teresa Dunn (Uniformed Services University of the Health Sciences) have organized an exciting **"Lipid and Membrane Metabolism"** theme focused on this topic. The symposium will address current discoveries and new ideas in phosphoinositide biology and signaling; sphingolipid metabolism and biological regulation; phospholipase D and phosphatidic acid signaling and the biology of neutral lipid metabolism and trafficking.

2011 annual meeting organizers Kuan-Teh Jeang and Daniel M. Rabin.

Signal transduction always has held the interest of biochemists and molecular biologists. The **"Signal Transduction from the Plasma Membrane to the Nucleus"** theme for the 2011 meeting will be organized by Karen O'Malley (Washington University School of Medicine) and Journal of Biological Chemistry Associate Editor Charles E. Samuel (University of California, Santa Barbara). Speakers will present research on JAK/STAT signaling; signaling from endosomes and beyond; sensors and adapters in innate immunity; and a topic titled "Synchronizing the Synchronizers," which should be very timely.

The interplay between metabolism and disease is receiving increasing attention from the scientific community and the media. Barbara E. Corkey (Boston University) and Marc Prentki (Montreal Diabetes Research Center) have organized presentations for a **"Metabolism and Disease"** theme that will cover mitochondrial function and disease; metabolic communication; metabolic signal transduction and metabolism and cancer.

For those who want to learn more about enzyme catalysis, Squire J. Booker (Pennsylvania State University) and L. Mario Amzel (the Johns Hopkins University School of Medicine) have put together several lectures in the

"Structure, Mechanism and Regulation in Enzyme Catalysis" theme. The talks will shed light on kinases, phosphatases and phosphorus in biological reactions; metals in redox chemistry; processive enzymes and sulfur chemistry in biological redox. These enzymes and processes are found in a wide variety of scientific disciplines, and the lectures will highlight the recent discoveries and emerging concepts unifying these topics.

Fundamental and applied progress in biological therapies depends on understanding chemical biology. The **"Chemical Biology and Drug Discovery"** theme, organized by Shana O. Kelley (University of Toronto) and Tamara L. Hendrickson (Wayne State University), covers topics for both novice and seasoned investigators. Sessions will include lectures on the chemical biologist's toolbox; peptide-based drug delivery; drug discovery and biomaterials; novel approaches to high throughput drug discovery; and the chemical biology of human disease.

The biochemistry of RNA is a classic, as well as a new, topic. For the **"Biochemistry of RNA"** theme, E. Stuart Maxwell (North Carolina State University) and Tina M. Henkin (Ohio State University) have organized presentations on recent discoveries of RNA-based gene regulation in bacteria; RNA editing and nucleotide modification; RNA/RNP transport and localization and small RNA regulation of mRNA translation. RNA research has become a fast paced area, and the thematic talks promise to be very stimulating and thought-provoking.

Complementing the RNA theme is a **"DNA Replication, Recombination and Repair"** theme. Joann B. Sweasy (Yale University School of Medicine) and Marlene Belfort (Wadsworth Center, New York State Department of Health) will chair this symposium. They will select speakers to provide insight on aberrant DNA repair; genomic instability and cancer; site-specific recombination in chromosome dynamics and gene therapy; replication of non-canonical DNA sequences and genomic instability and retroelements in genome plasticity and cancer. If you are interested in DNA research, you won't want to miss these talks.

Qiang Zhou (University of California, Berkeley) and Karolin Luger (Howard Hughes Medical Institute/Colorado State University) will spearhead the **"Biochemistry of Transcription and Chromatin Structure/Organization"** theme. They have put together a program encompassing new concepts of RNA polymerase pausing and elongation; transcriptional regulation in cell growth, differentiation and disease; the mechanisms of structural transitions in chromatin and alternative chromatin structures.

And finally, the ASBMB Minority Affairs Committee is sponsoring a special symposium on obesity. The lecture series, titled **"The Frontiers in Obesity Research,"** will explore system physiology modeling of human metabolism and body weight changes; the quantification and therapeutic potential of brown adipose tissue; the biochemistry of addiction; cardiac complications of obesity and the potential use of dietary garlic to prevent the development of, or alleviate, obesity and diabetes in mice. There also will be lectures on strategies for obesity prevention; the role of stearoyl-coA desaturase in energy metabolism; the adipose renin-angiotensin system; obesity and insulin resistance and adipokine regulation of energy and glucose homeostasis.

Topical and Technical Workshops

We also have organized a workshop in collaboration with the Chemical Biology and Drug Discovery and Metabolism and Disease theme. The workshop will focus on mitochondrial-metabolic defects and chemical strategies for addressing these problems. Another workshop on transcription and chromatin also is being planned.

Exploring Educational Challenges

Each year, the Education and Professional Development Committee offers programming that explores educational challenges. For 2011, the committee has organized a session titled **"It Didn't Work! Coping with 'Failure' for Students and Professionals."** This symposium will cover ways to foster interactions between college and university scientists and high schools; how to deal with frustrations at the bench; developing classroom management skills; mentoring students in the research laboratory and the art of collaboration. These topics especially should appeal to the young scientists and their teachers.

Look for more information in the individual themes and award lectures in future issues of ASBMB Today. Additional details on all the activities planned for the 2011 meeting and how to register and submit abstracts will also be forthcoming.

Daniel M. Raben (draben@jhmi.edu) is director of the ASBMB Lipid Division and also a professor in the department of biological chemistry at the Johns Hopkins University School of Medicine. Kuan-Teh Jeang (kjeang@niaid.nih.gov) is chief of the molecular virology section of the National Institute of Allergy and Infectious Diseases at the National Institutes of Health.

ASBMB Teams up with Brazil on Biofuels Workshop

BY NICK ZAGORSKI

Biofuels are big business in Brazil. Combining an abundance of sugarcane, a willing government and recent technological advancements, the production of ethanol-based fuels is re-emerging as a major economic driver of this South American country. And, certainly, their recent agreement with the United States to share alternative fuel technologies and strategies has been a positive development as well.

In a reflection of that U.S.-Brazilian partnership, the American Society for Biochemistry and Molecular Biology is teaming up with the Brazilian Society for Biochemistry and Molecular Biology (SBBq) and the International Union of Biochemistry and Molecular Biology to present an advanced course on the biochemistry of biofuels, to be held September 25-October 3 in the Brazilian coastal city of Ubatuba.

Although the complete itinerary still is being finalized, this intensive one-week course is poised to feature a group of top level U.S. and international scientists discussing fundamental biofuel-related research topics; Areas that will be covered include sugar metabolism, cell wall biology, synthetic biology and the impact of biofuels in the developing world.

"Our goal is not to simply have scientific presentations," notes ASBMB Past-President Bettie Sue Masters, one of the principal organizers of the event. "We plan on having detailed and interactive workshops that really explore the basic science behind biofuels, including potentials and limitations."

The course will be open to up to 40 young researchers (no more than 5 years past Ph.D.) from around the world who already work in a biofuel-related field or are interested in joining this field of research.

The idea for this course germinated during conversations between Masters and SBBq President Debora Foguel, following a visit by Masters to give an invited lecture at the Federal University of Rio de Janeiro in Brazil.

The pair then gathered colleagues from both societies and the IUBMB to create an international advisory board, including another ASBMB past-president, Judith Bond. "Judy had made expanding Pan-American initiatives one of her goals during her presidential tenure a few years back, unfortunately, due to various circumstances it didn't quite work out," says Masters. "Now, though, it seemed external forces were working in our favor, and she's been instrumental in helping set this course up."

The program organizers believe this course on biofuels will help foster new contacts between scientists from numerous countries and entice more promising young scientists to enter this important – and global – field of research.

Down the road, the advanced course in biofuels is envisioned to be just the first part of a three-year (and hopefully beyond) cooperative commitment between these North and South American societies (as well as the IUBMB); future programs may include a larger, joint scientific conference as well as student exchange programs between U.S. and Brazilian labs. ASBMB and SBBq also hope that other scientific societies in the Americas will join this cooperative effort to create a full and vibrant Pan-American initiative.

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

Advanced School on Biochemistry of Biofuels

Lecture Topics:

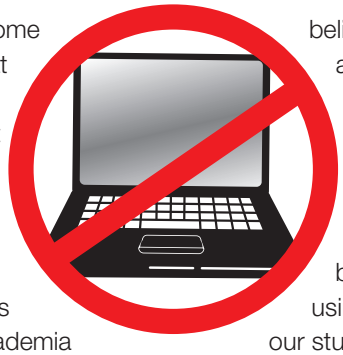
- Sugar metabolism and bioethanol production
- From cell wall biosynthesis to lignocellulosic ethanol
- Synthetic biology and custom-designed products
- Impact of biofuel production in the developing world

Doctoral students, postdoctoral fellows and young researchers (no more than 5 years out of graduate school) are eligible to apply. Proficiency in English is essential. Deadline is July 1, 2010.

For more information, visit http://sbbq.iq.usp.br/biofuel.

Banning Laptops in Classrooms

BY J. ELLIS BELL



I am amused by recent discussions in some higher education circles suggesting that laptop computers should be banned from lecture rooms. The argument is that students are using the laptops to view e-mail, look at Facebook, see sports scores, or, I'm sure in some institutions, to check the performance stocks. Some students, to be sure, will use their laptops to take notes in class, but, the fear in academia is that the majority will use their computers for nonacademic pursuits. I'm sure we have all seen examples of these "misuses" of computers in class – I know I have attended seminars where students are doing everything from working on homework for another class to surfing the Web, rather than listening to the seminar. But, I've also seen many people taking notes about the seminar on their laptops.

So, why do students surf the Web during a seminar or class? I suspect it is because they find the lecture boring! As a result, they don't believe they will learn anything, so they do other things that concern them. Whose fault is this? Rather than blaming the students for not wanting to learn or being lazy, I think we should consider another explanation: Maybe the class or seminar really is boring. In a research seminar, we expect the speaker to keep things interesting so the audience pays attention. However, in a classroom, we make the assumption that no matter how we run the class, the students will be engaged and want to learn. But, is this always true?

While we would hope that active learning thrives in the college classroom, quite often, this is not the case, especially when the old-fashioned "stand and deliver" lecture is used. (This is usually accompanied by an endless stream of PowerPoint slides, often handed out to the student for note taking. I once heard the phrase "all power corrupts, PowerPoint corrupts absolutely" at a meeting. Unfortunately, I don't remember who said this, but they have my undying thanks for making such a memorable comment.) This model of education rests on the assumption that "facts" are the currency of education, and, if we don't "teach" students the appropriate facts, we are not doing our job.

With the current state of the molecular life sciences, I believe nothing could be further from the truth, and, this is where laptop computers come into play. With a laptop computer and a high speed internet connection (many campuses are "wireless" these days), facts are at the fingertips of every student with a laptop. (I can hear you saying "yes, but Wikipedia isn't what we want students using," and I agree – we should be teaching our students how to use the Web appropriately and making peer-reviewed electronic resources available.)

This past semester, I taught an advanced proteins course, and, while not required, many students brought their laptops to class. We did a lot of small group discussions in the class, and each group usually had at least one laptop-carrying student in it. By creating a situation where students could, and usually had to, look up information, find papers and be ready to discuss what they found, both amongst themselves and with the rest of the class, the students were fully engaged and were using their laptops productively.

Rather than talking about banning laptops from class, we should be talking about how to constructively use them to engage students in classroom activities and active learning. As information technology advances, there are many ways that laptops can, and will, be incorporated into classroom activities – ways that keep students interested and engaged in the topics of the course, whether it is accessing information or giving responses to questions in a more detailed way than the current "clickers" allow.

This is my last "regular" column as chair of the Education and Professional Development Committee. Peter J. Kennelly is taking over next month. I would like to thank all of the people I have worked with on the EPD and the Undergraduate Affiliates Network Committee (chaired by Neena Grover) over the years. You are a great group of folks to work with, and you deserve most of the credit for the progress we, as a community, have made in educational and professional development matters in recent years. Thank you. XXX

J. Ellis Bell (jbell2@richmond.edu) is professor of chemistry at the University of Richmond.

Hispanics and the Future of America

BY THOMAS LANDEFELD

When you consider the fact that approximately 33 percent of the current U.S. population is represented by Blacks, Hispanics and Native Americans, the underrepresentation of these groups in the sciences is unconscionable. Moreover, with significant increases expected in the Hispanic population over the next 25 years, the underrepresentation of minorities, and, in particular, Hispanics, will continue to plague our country and our entire scientific enterprise. Significantly, this issue will remain at all levels of academia — i.e. in populations of students, academic faculty, health professionals, administration officials and, of course, professional scientific societies such as the American Society for Biochemistry and Molecular Biology.

John F. Alderete, professor at Washington State University, gave a talk at the 2009 Society of Hispanic Professional Engineers conference as part of the Advancing Hispanic Excellence in Technology, Engineering, Math and Science Distinguished Lecture Series. In the lecture, Alderete discussed the state of education in the Hispanic community and its effects on the country. This presentation is very relevant to the current and future goals of ASBMB, and, as such, the ASBMB Minority Affairs Committee has reproduced an excerpt from his talk below.

You are part of a new America. The diversity represented in this new global village must learn to work together if our nation and the American dream are to survive. Although we no longer look like the America of a hundred years ago, we need to make it clear that we want to preserve the American dream, making it better, more secure and more accessible to more of our citizens. We must work together to make our nation and world safer for diversity.

Today, Latinos represent 15 percent of the American population. Before 2050, we'll be 30 percent.

Between 2000 and 2006, the U.S. population grew by 6 percent, Latinos grew by nearly 25 percent.

Today, the median U.S. age is 37 years old. The median age for Latinos is 27 years old.

From 1990 to 2013, the buying power of white Americans will grow 200 percent. Latino buying power will grow 560 percent.

In the next 10 years, we'll experience a net growth in the labor force of 77 percent. Latinos will be part of the labor work force because we are young and do not belong to the highest Ph.D. levels in university, government or industry science, technology, engineering and mathematics research.

One recent study revealed that Latino children start life at an intellectual level on par with other American children, but, by age 2, they are already behind in linguistic and cognitive skills. We have a large percentage of Latina moms with less formal schooling. This means that their children receive lower quality reading activities, vocabulary, educational games and math, which should begin as early as three months after birth. The language gap between white and Latino students remains unbelievably large, inhibiting full participation in democracy and high level achievement.

John F. Alderete professor at Washington State University

I recently learned that the national retention rate for underrepresented minority engineering students is approximately 35 percent. The corresponding rate of nonminority engineering students is approximately 70 percent. This means that one of three white students won't graduate, whereas two in three underrepresented minority students won't graduate, and, if they do, it won't be in a science field.

With respect to the educational apartheid, we should be righteously indignant and unapologetic in our anger. The question is, what role will you play in America's future? In education? In solving the most urgent national and global problems that only engineers, chemists, physicists and science can address?

Your bachelor's degree isn't an end but a beginning. If the issue is being poor, then stay poor and continue

your graduate education, which will provide more financial security. If you must get a job, get one that assures continued education toward a Ph.D., the highest degree conferred upon a human being.

In order to be a competitive Hispanic STEM student, you must be focused, completely absorbed in your coursework. The word "competitive" means that you will have what it takes to become someone special. Someone special gets accepted into graduate school. Someone special sets himself or herself apart by virtue of graduating in four years with a better than 3.0 GPA. Someone special has gained research experience in a laboratory. Someone special does not compromise his or her grades by becoming overextended in minority student-run organizations. If you want to be a competitive leader, get good grades. Go above and beyond required courses, taking additional and tougher courses. Go to departmental seminars. If a National Academy inductee or Nobel laureate is the invited speaker, you need to attend, even if he or she doesn't look like you, and you don't understand the subject.

"One recent study revealed that Latino children start life at an intellectual level on par with other American children, but, by age 2, they are already behind in linguistic and cognitive skills."

I am one of the few Chicano/Latino scientists in our country, and I have a privileged life. Imagine a life where you can make a discovery that improves the health of people. Imagine being invited to give talks at universities all over the world and giving a talk in the same lecture room once used by Albert Einstein. All this, and much, much more was possible for this poor Mexican American because I was anchored to my culture — a refuge to which I could always return. It is a culture that valued education.

You too can experience all of this. Higher education opens many doors. Each of us has to do something — just some small ripple — to help one another, our families, our community and our nation. When it comes to you and education at the highest levels, "Si, se puede."

Thomas Landefeld (tlandefeld@csudh.edu) is a biology professor at California State University Dominguez Hills.

MAC Spotlights Minority Researchers in New Web Feature

The American Society for Biochemistry and Molecular Biology Minority Affairs Committee has added a new feature to its website to highlight the life and work of minorities in the biological sciences.

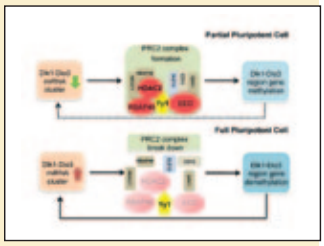
Launched in April, the site spotlights a different scientist each month. The researchers are given the following nine questions, and the answers are posted on the site (http://bit.ly/c61eJv):

1. Can you tell us about your current career position?
2. What are the key experiences and decisions you made that have helped you reach your current position?
3. How did you first become interested in science?
4. Were there times when you failed at something you felt was critical to your path? If so, how did you regroup and get back on track?
5. What advice would you give to young persons from under-represented backgrounds who want to pursue a career in science similar to yours?
6. What are your hobbies?
7. What was the last book you read?
8. Do you have any heroes, heroines, or role models? If so, can you describe how they have influenced you?
9. What is it that keeps you working hard and studying science everyday?

John F. Alderete, whose talk at the 2009 Society of Hispanic Professional Engineers conference was featured in the main article in this column, was the highlighted scientist for April. To read his spotlight, go to http://bit.ly/conFtn.

Marion Sewer, associate professor in the Skaggs School of Pharmacy and Pharmaceutical Sciences at the University of California, San Diego, was the MAC featured scientist for May 2010. You can find this spotlight at http://bit.ly/a8yUx1.

Unlocking Maximum iPS Potential



A working model for miRNA regulation of iPS pluripotency.

The successful reprogramming of differentiated adult cells into induced pluripotent stem cells has opened up a valuable new road for stem cell research. However, iPS cells do suffer from low reprogramming efficiency and reduced pluripotency, which somewhat has limited their potential. A quick and effective method to determine which newly reprogrammed iPS cells have the best pluripotency potential would significantly increase the success rate of creating robust iPS cell lines. In this study, the authors found that the conserved imprinted region Dlk1-Dio3 was activated in fully pluripotent mouse stem cells but repressed in partially pluripotent stem cells and that the degree of Dlk1-Dio3 activation positively correlated with pluripotency levels. What's more, the miRNAs encoded by this region also exhibited significant expression differences between fully and partially pluripotent stem cells. Several of these miRNAs may target and repress the PRC2 gene-silencing complex, thus forming a feedback loop resulting in the expression of all proteins and RNAs encoded within the Dlk1-Dio3 region. This exciting study suggests that Dlk1-Dio3 activity may serve as a biomarker to identify fully pluripotent iPS cells. This not only provides more understanding about cellular reprogramming but also can advance the application of iPS cells in therapeutics.

Activation of the Imprinted Dlk1-Dio3 Region Correlates with Pluripotency Levels of Mouse Stem Cells

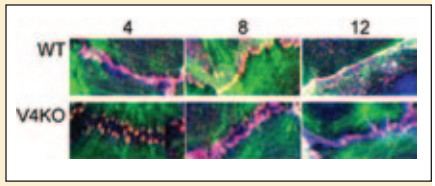
Lei Liu, Guan-Zheng Luo, Wei Yang, Xiaoyang Zhao, Qinyuan Zheng, Zhuo Lv, Wei Li, Hua-Jun Wu, Liu Wang, Xiu-Jie Wang and Qi Zhou

J. Biol. Chem., published online April 9, 2010

jbc

A TRP to the Junction

TRPV4 is a calcium channel that acts as a physiological sensor for stimuli such as heat, osmotic pressure and mechanical deformation. Skin keratinocytes are one of the cell types that express TRPV4. This is interesting because studies have shown that calcium signals can play a role in keratinocyte differentiation. Thus, TRPV4 and other TRP calcium channels might be involved. In this study, the researchers found that TRPV4 interacts with β-catenin, the protein that links adherens junctions to the actin cytoskeleton, and a critical component of skin, as it promotes the tight barrier between skin cells. In cell studies, they found that TRPV4 localized to where cell-cell junctions are formed, and TRPV4 deficiency resulted in abnormal cell-cell junction structures and higher intercellular permeability; in vivo, this translated to TRPV4-deficient mice displaying impaired intercellular junction-dependent barrier function in their skin. In TRPV4-deficient keratinocytes, extracellular Ca^{2+}-induced actin remodeling was delayed, which was accompanied by a significant reduction in the activation of the small GTPase Rho, a key regulator of keratinocyte differentiation. Together, the results of this study suggest a novel role for TRPV4 in the development and maturation of cell-cell junctions in the skin, indicating a critical role in maintaining skin integrity.



TRPV4-KO cells show a delay in intercellular contact formation in response to extracellular Ca^{2+} induction compared with WT; stains are for actin (green), β-catenin (blue) and E-cadherin (red).

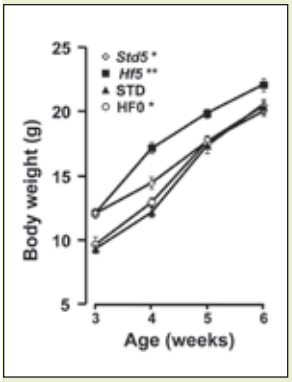
The TRPV4 Channel Contributes to Intercellular Junction Formation in Keratinocytes

Takaaki Sokabe, Tomoko Fukumi-Tominaga, Shigenobu Yonemura, Atsuko Mizuno and Makoto Tominaga

J. Biol. Chem., published online April 22, 2010

jbc

Breeding Fat



Offspring of mice who ate a high-fat diet weighed more at the time of weaning and weighed more after eating a high-fat diet.

Obesity has reached epidemic proportions, becoming increasingly common at younger ages. Recent evidence suggests that the unbalanced consumption of different fats, such as a high linoleic acid (LA) to α-linoleic acid (LNA) ratio diet, is a risk factor for obesity. Here, the authors examine the effects of transgenerational consumption of a high LA/LNA ratio diet using mice. Mice fed this diet gained weight, a trend that transgressed subsequent generations. The high-fat diet changed the lipid composition in the plasma, adipose tissue and mothers' milk, increasing LA and arachidonic acid (ARA) while decreasing long-chain polyunsaturated fatty acids, such as eicosapentaenoic (EPA) and docosahexaenoic acids (DHA). While the atypical lipid profile and weight reverted to normal when mice were switched to a standard diet, an incomplete reversion in the epididymal fat pad was observed. Furthermore, the offspring of the mice were heavier at weaning, an effect that persisted despite receiving a standard diet. Altered insulin and adipokine levels and adipocyte cellularity and gene expression profiles were observed between generations and between diet regimen groups. Together, this work establishes a model to examine transgenerational fat mass accumulation, giving insight into possible epigenetic factors associated with this phenomenon.

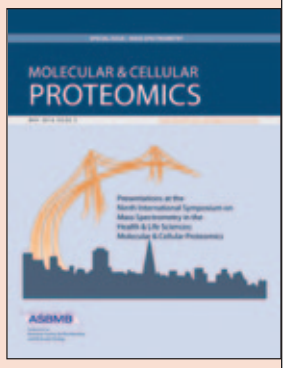
A Western-like Fat Diet Is Sufficient to Induce a Gradual Enhancement in Fat Mass Over Generations

Florence Massiera, Pascal Barbry, Philippe Guesnet, Aurélie Joly, Serge Luquet, Chiméne Moreilhon-Brest, Tala Mohsen-Kanson, Ez-Zoubir Amri, Gérard Ailhaud

J. Lipid Res., published online April 20, 2010

Mass Spectrometry and the Evolution of Proteomics

The importance of mass spectrometry in the development of proteomics is well documented by the proliferation of publications, meetings, conferences and other forums devoted to it. The International Symposium on Mass Spectrometry in the Health and Life Sciences represents one outstanding example; started in 1984 at the University of California, San Francisco and held biennially since 2001, there now have been nine meetings in this series, most recently in August 2009. In recognition of the meeting, the May issue of Molecular and Cellular Proteomics contains 21 articles from the 9th symposium. These articles represent the broad scope of topics covered and demonstrate the central role that mass spectrometry plays in deciphering the molecular understanding of biology. The articles include descriptions of new mass spectrometry applications and software that give more extensive and sensitive analyses of complex protein mixtures; applications to difficult biological problems such as stem cell biology and protein/protein interactions; neurobiological studies in higher systems and translational applications like biomarkers and forensic science. Although it showcases only a handful of the fields of study to which proteomics has made and will continue to make significant contributions, this special issue reinforces mass spectrometry's place as one of the premier tools in current biological and biomedical research.



Highlights from the 9th International Symposium on Mass Spectrometry

Mol. Cell. Proteomics, published May 2010

Nontraditional Career Options for Life Scientists

BY CLIFFORD S. MINTZ

There is a growing realization among many American life sciences graduate students and postdoctoral fellows that a job as a tenure track assistant professor or research scientist at a pharmaceutical or biotechnology company may no longer be a viable option. This trend largely has been driven by cuts in research funding, fewer tenure track positions and the outsourcing of research and development jobs to Asia, Eastern Europe and South America by a growing number of pharmaceutical and biotechnology companies.

Because most graduate programs continue to emphasize, and almost exclusively focus on, training for traditional academic and industrial research careers, newly minted doctorates and postdocs are finding it nearly impossible to find jobs. Unfortunately, through no fault of their own, many doctoral-trained American life scientists now are facing the prospect of long-term unemployment. Thus, many graduate students and postdocs are beginning to explore, on their own, nontraditional career opportunities to find gainful employment in the life sciences.

Some of the more traditional alternate career options include medical, dental or nursing school and other medically related fields; law school (mostly related to patent and intellectual property law); business school or management consulting. While most of these options are a good fit for doctoral-trained life scientists, they typically require additional schooling and training and may be out of reach for those who cannot afford to wait any longer to find a job to support themselves and their families. With this in mind, I list below some lesser-known alternate career options that may represent viable choices for many doctoral-trained life scientists. Also, I indicate which of the choices may require additional training or related work experience:

- Technical writing (science or medical)
- Business analysis (for venture capitalists or banking firms)
- Biotechnology sales
- Health informatics
- Medical communications and conference planning
- Competitive industrial intelligence
- U.S. Food and Drug Administration investigator/reviewer/inspector opportunities
- Nontraditional government jobs in the Central Intelligence Agency, Department of Defense or Defense Advanced Research Projects Agency
- Quality control and assurance (may require additional training)
- Regulatory affairs (may require more training)
- Pharmaceutical/biotechnology marketing (may require sales experience)
- Business development (may require sales or previous business experience)

It is important to note that, while the above career options may be suitable for many doctoral scientists, the requirements for success in some may not be readily apparent. For example, over the past five years or more, there has been a sharp rise in the demand for medical writers with advanced science degrees. However, while most doctoral-trained life scientists have the scientific credentials to become medical writers, the caveat is that you have to love to write! Typical medical writers spend 40 or more hours a week writing. So, if you don't like to write, medical or science writing may not be the right career option for you.

Another related field that warrants mention is medical communications. Medical communication professionals spend most of their working hours talking to, and interacting with, people. In other words, you have to be a "people person" if you want to excel in this career. Consequently, if you are not very social or overly communicative, then medical communications may not be right for you. The point I am trying to make is that before you decide on a particular career path, it is important to determine whether or not you possess the appropriate traits, behaviors and skills to master the choice.

One new and rapidly growing field is healthcare informatics technology (HIT). The exponential growth of the HIT field mainly has been driven by the Obama administration's push

"Because most graduate programs continue to emphasize, and almost exclusively focus on, training for traditional academic and industrial research careers, newly minted doctorates and postdocs are finding it nearly impossible to find jobs."

to digitize all American medical and healthcare records over the next five years. Doctoral-trained life scientists with a background in bioinformatics, genomics and database management are ideal candidates for HIT jobs. Because many industry analysts already are predicting future personnel shortages for many HIT jobs, many community colleges and four-year institutions even have developed certificate and masters' degree HIT programs.

Other life sciences disciplines that are experiencing greater-than-normal demand include regulatory affairs and quality control and assurance. However, it is important to point out that both of these career options require specialized training and, likely, some hands-on work experience. A good way to enter the regulatory affairs and quality control fields with minimal additional formal training is to land an internship at a pharmaceutical or biotechnology company or at the FDA. More and more companies and government agencies are beginning to offer internship opportunities to qualified individuals. Unfortunately, many of these internships are not well publicized or widely advertised. Consequently, you will have to do a little work to find them!

In conclusion, there is no question that traditional job opportunities for doctoral-trained life scientists are fewer in number and that they continue to disappear at alarming rates. Despite this troubling trend, most life sciences graduate programs steadfastly refuse to change or adjust their training programs to enable their graduates and postdoctoral fellows to compete for non-traditional life sciences job opportunities. Unless systemic changes are implemented at the graduate training level, it is likely that doctoral life scientists who receive traditional training will continue to face long-term unemployment well into the 21st century.

Clifford S. Mintz (cliff@biocrowd.com) is a freelance writer, blogger and speaker at career fairs and professional meetings.

Looking for a job or a place to post a job opening?

Visit the American Society for Biochemistry and Molecular Biology job board at http://www.asbmb.org/jobs

Exploring Membranes: The Work of Sarah L. Keller

BY THE ASBMB LIPID RESEARCH DIVISION

Cell membranes are composed of a broad spectrum of lipids and proteins. The behavior of membranes, even "simple" model membranes that contain only lipids and no proteins, is remarkably rich. For example, lipids in a membrane respond to particular changes in temperature or overall membrane composition by undergoing a miscibility transition. This means that lipids in a uniform membrane suddenly sort into distinct regions that are enriched in different lipid types. Sarah L. Keller, a professor of chemistry at the University of Washington and the inaugural Avanti Young Investigator in Lipid Research Awardee, uses fluorescence microscopy to visualize these membrane regions and to identify the temperatures and compositions at which miscibility transitions occur. One of the lipid types is labeled with a molecule that fluoresces. Regions of the membrane that are enriched in this fluorescently labeled lipid appear bright in their images (Figure 1).

Miscibility transitions affect not only a membrane's lipids but also its proteins. A protein that is located in the middle of a membrane domain may behave very differently from an identical protein that is located in the surrounding membrane or in a uniform membrane. As a specific example from Keller's work, alamethicin molecules form ion channels in membranes. The channel adopts a structure that conducts more ions when the channel resides in membranes made of one lipid type (phosphatidylcholines) than another type (phosphatidylethanolamines).

Recently, Keller and her group turned their attention to asymmetric membranes, inspired by the observation that the inner and outer leaflets of cell membranes have strikingly different lipid compositions. The two leaflets also are assumed to differ in their ability to form membrane domains. The Keller group showed that liquid domains in the outer leaflet can induce domains in the inner leaflet of an asymmetric, protein-free Montal-Mueller bilayer. Furthermore, by tuning the lipid composition of only one of the leaflets, they were able to suppress domains in the entire bilayer. Induction of domains across asymmetric membranes has strong relevance to questions in cell biology as it may prove to be a mechanism for colocalization of inner and outer leaflet proteins during cell signaling events.

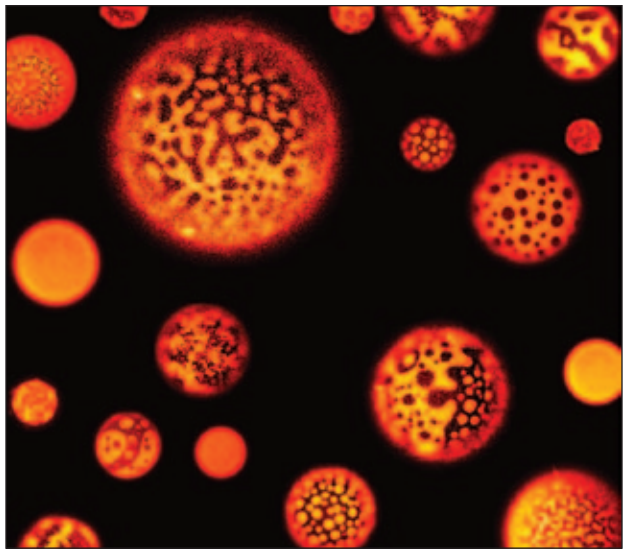
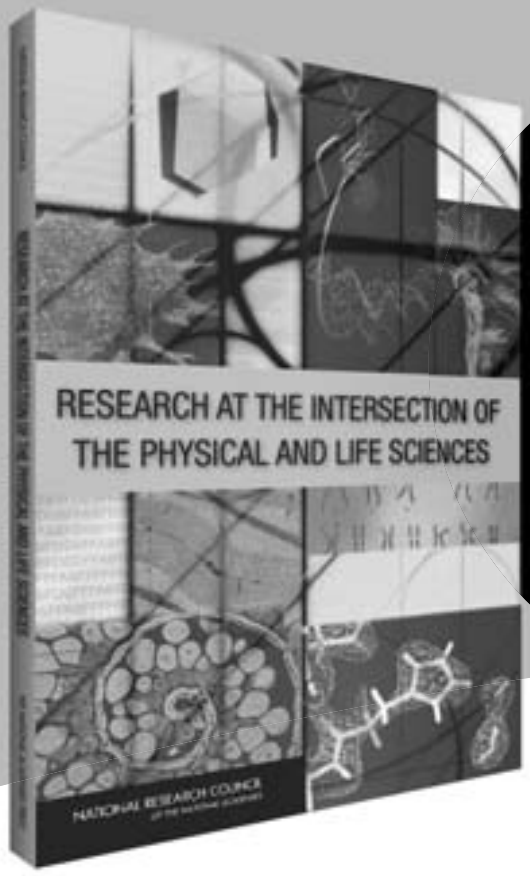


Figure 1. A collection of fluorescence images of vesicles (lipid membranes in the shape of a spherical shell of roughly 20-100 micrometers in diameter). Each membrane contains a mix of lipid types, including one that is labeled with a fluorescent probe and appears bright. The lipids in some membranes are uniformly mixed, and the vesicle appears uniformly bright across its surface. The lipids in other membranes have segregated into domains, which are enriched in particular lipids, so the membrane exhibits contrasting bright and dark regions. Composite image by Aurelia Honerkamp-Smith.

Keller has been recognized not only for her interdisciplinary research, but also for her mentoring and teaching. She was given the University of Washington Distinguished Teaching Award in 2006 and the department of chemistry Outstanding Teaching Award in 2004. The students and postdoctoral fellows who work with her have been recognized with their own honors. Her first doctoral student, Sarah Veatch, was awarded a National Institutes of Health Pathway to Independence Award and will join the biophysics faculty at the University of Michigan this summer. Her most recent doctoral student, Aurelia Honerkamp-Smith, was just awarded the Anna Louise Hoffman Award for Outstanding Achievement in Graduate Research by Iota Sigma Pi, the national honor society for women in chemistry.

THE NATIONAL ACADEMIES PRESS

Research at the Intersection of the Physical and Life Sciences



AVAILABLE NOW

Paperback | $32.00
PDF | $24.50
Paperback + PDF
Bundle | $37.50

124 pages,
7 x 10, 2010

An excellent resource for academic and research institutions, scientists, universities, and federal and private funding agencies interested in pursuing research that lies at the intersection of physical and life sciences.

Browse before you buy at
www.nap.edu

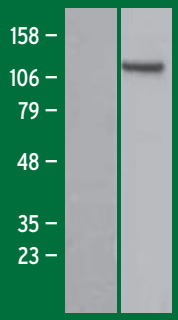
TrueORF Gold cDNA Clones

Validated for Protein Expression!

- Tested individually by Western
- Sequence verified
- Transfection ready
- Easy-shuttle into over 60 vectors
- Next day delivery

Why settle for clones with little validation or wait for gene-synthesis?

TrueORF Gold delivers quality and promptness in one tube. Each clone is validated for proper protein expression via western blot, and supplied as highly purified plasmid DNA using ion-exchange columns. TrueORF Gold is the most reliable and convenient cDNA clone for protein expression and functional study.



HEK293 were transfected with L) empty vector R) TrueORF for Myc/DDK-tagged hTERT(Cat# RC217436). The lysates were analyzed using anti-DDK antibody to show over-expression of hTERT. *DDK is the same as FLAG.

ORIGENE
Your Gene Company

origene.com/TrueORF_Gold