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August 2009

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American Society for Biochemistry and Molecular Biology

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ASBMB
American Society for Biochemistry and Molecular Biology

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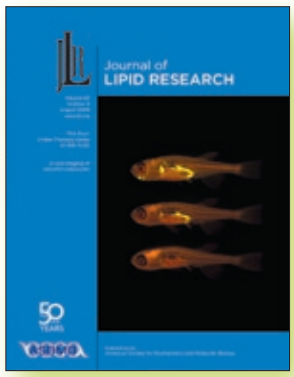

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To hear this and other podcasts, go to www.asbmb.org/audio.aspx.

ASBMB today

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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

Magazine design & production: Amy Phifer

ASBMB
www.asbmb.org

2008 APEX AWARDS FOR PUBLICATION EXCELLENCE

letters to the editor

Environmentally Friendly Mailing

Hello Nicole Kresge,

I enjoy reading *ASBMB Today*; it really is one of the best of its kind of publication. I help with our university's publication of a similar item called *LSU Research*, so I know the amount of effort and care needed to produce something interesting and worthwhile. My only negative comment is: please get rid of the plastic bag part of the mailing—ASBMB should be setting a greener example on that front.

Thanks and keep up the good work,
Vince J. LiCata

Lewis S. Flowers Professor
Brij Mohan Distinguished Professor
Department of Biological Sciences Louisiana State University

RESPONSE

The bag we mail our magazine in is biodegradable and recyclable. We're hesitant to mail without a bag because the magazine may get destroyed *en route*.

What Doctors Know

BY GREG PETSKO

What do you want the person in charge of your health to know? Should doctors be scientists or at least think like them? How well are we preparing premedical students for medical school and medical students for the practice of medicine? Are doctors able to evaluate critically competing claims from drug manufacturers, to understand the importance of personalized medicine, and to realize when drugs might interact with one another? Is medical education hopelessly out of date, or is it the perfect apprenticeship for the modern physician?

If you're like me, you probably have some pretty strong opinions about these questions and a bunch of related ones I won't bother to state. And you also probably feel that, if change is needed, it isn't likely to happen, because everybody—from the textbook authors and publishers to the classroom teachers to the Medical College Admission Test (MCAT) people—has a vested interest in the status quo of medical education. Well, brace yourselves folks, and, as Bob Dylan said,

Admit that the waters
Around you have grown,
And accept it that soon
You'll be drenched to the bone;
If your time to you
Is worth savin',
Then you'd better start swimmin'
Or you'll sink like a stone—
For the times, they are a-changin'.

The catalyst for the changing of the times is a report that was just issued under the joint auspices of the Association of American Medical Colleges (AAMC) and the Howard Hughes Medical Institutes (HHMI). The report is called "Scientific Foundations for Future Physicians (SFFP)" and a copy can be downloaded from the AAMC website (www.aamc.org/scientificfoundations). I urge every one of you to read this report, because if its recommendations are widely adopted—and I hope they will be—they will change the way we do business.

The SFFP report is the product of a committee of 22 scientists, physicians, and science educators; the educators were drawn from medical schools, private and public universities, and small colleges. I was one of them, so the report bears my signature, and I stand by every recommendation. When the committee was first assembled by the AAMC and HHMI, its charge was to "recommend the specific competencies in the natural sciences fundamental to medicine that all premedical students should demonstrate before entry into medical school and that medical students should demonstrate before receiving the M.D. degree." (Please note that both premedical and medical education were to be considered.) A "competency" was defined as a "knowledge, skill, or attitude that enables an individual to learn and perform in medical practice and to meet or exceed the standards of the profession." In other words, what doctors need to know.

It's very important to understand what the committee was NOT charged to do. We had no mandate to devise a model curriculum, and we didn't. We were not told to make recommendations about how the competencies should be assessed, and we made none. And we were explicitly told to ignore the behavioral and social sciences, as these were the subject of a separate report—also based on the idea of competencies, by the way—that a different committee was preparing for release in 2010.

We met face-to-face five times and exchanged reams of material. We argued, cajoled, entreated, and fussed. We had superb leadership—the co-chairs were Sharon Long of Stanford University and Bob Alpern of Yale Medical School—and we needed it: herding cats would not be a bad description of what they had to do. We also benefited from outstanding project leadership from Peter Bruns, Vice President for Grants and Special Programs, and William Galey, Program Director for Graduate and Medical Science Education, both from HHMI; and David Korn, former Chief Scientific Officer, Carol Aschenbrener, Executive Vice President, and Jodi Lubetsky, Manager, Science Policy, all from AAMC. I worked most closely with Jodi, and believe me, she can be in my foxhole any day. In the end, we produced something as close to a consensus as 22 people of disparate backgrounds and philosophies could ever be expected to produce. I'm proud of the work we did, and I hope it will be well-received.

If it is, it will change the shape of the world for biochemists in the U.S. The report is based on 11 overarching principles; to give you a feeling for them, here are three:

- The practice of medicine requires grounding in scientific principles and knowledge.
- Modern medicine requires the ability to synthesize information and collaborate across disciplines.
- Scientific matters can and should be communicated clearly to patients and the public.

It then goes on to define 16 essential competencies, eight for entering medical students and eight for medical graduates. The competencies are designed to be very broad so that they can be fulfilled in a number of ways. For example, the first one for premeds is to "apply quantitative reasoning and appropriate mathematics to describe or explain phenomena in the natural world."

Each competency is then broken down into a set of learning objectives and examples. For the competency above, the first learning objective is "demonstrate quantitative numeracy and facility with the language of mathematics," and an example of how this could be demonstrated would be "use dimensional analysis and unit conversions to compare results expressed in different systems of units." As I said, that's for entering medical students (*i.e.* the sort of thing that could be asked on the MCAT). Note that there are many different courses that could teach this competency, from statistics and math courses to laboratory courses in chemistry and physics. That's an underlying theme of the report; there is great flexibility in the way institutions and students can acquire the competencies. For comparison, a corresponding competency for medical school graduates is to "apply quantitative knowledge and reasoning—including integration of data, modeling, computation, and analysis—and informatics tools to diagnostic and therapeutic clinical decision making."

Note the clinical bent here. A learning objective for this competency is to "apply basic mathematical tools and concepts, including functions, graphs and modeling, measurement and scale, and quantitative reasoning, to an understanding of the specialized functions of membranes, cells, tissues, organs, and the human organism, in both health and disease," and an example is "interpret graphical representations of drug levels as a function of dosage and pharmacokinetics."

Biochemists will be interested in the competencies in their discipline. Here's one for entering medical students: Competency E5: demonstrate knowledge of how biomolecules contribute to the structure and function of cells. One of the learning objectives is to demonstrate knowledge of the structure, biosynthesis, and degradation of biological macromolecules. And here are a few examples of what someone possessing this competency should be able to do: "identify the major macromolecules (proteins, nucleic acids, carbohydrates, and lipids) and explain the way in which their structure affects their properties; explain how hydrophobicity and hydrophilicity drive molecular association and contribute to both specificity and affinity."

For medical school graduates, one of the biochemistry-oriented learning objectives is to "apply knowledge of the molecular basis of neoplasia to an understanding of the biological behavior, morphologic appearance, classification, diagnosis, prognosis, and targeted therapy of specific neoplasms," and an example of demonstration of competency is to explain the action of oncogenes in the context of normal growth factor-initiated signal transduction and how this information can be utilized for treatment of cancers (*e.g.* antibodies to EGFR in breast cancer, inhibition of tyrosine kinases in leukemias).

"Our intent is not to make medical school biochemists redundant; rather, it is to free them from having to teach what amounts to remedial college biochemistry, a subject that most first year medical students find either repetitive or largely irrelevant, and instead to allow them to teach the exciting and relevant areas of their discipline at a higher level."

Although we refrained from recommending specific courses, the fact is that the competencies we present cannot be met without considerable rethinking of the current premedical curriculum. Many medical schools do not currently require a biochemistry course for admission; the premed competencies in the report would be hard to meet without at least one semester of biochemistry, and probably a full year would be ideal. There are fewer chemistry, physics, and math competencies than would justify the current full year of basic college courses in these subjects required by most medical schools; on the other hand, the learning objectives in statistics would

almost certainly need a one-semester course to do them justice. If I were to design a curriculum to meet the recommendations in our report, one option might look something like this:

- One semester of general chemistry and one semester of organic chemistry, both with laboratory.
- One semester of general physics with lab and one semester of calculus.
- Two semesters of biology (molecular and cellular) with lab.
- One semester of statistics, with a biomedical orientation.
- One semester of genetics, including human genetics.
- Two semesters of biochemistry.
- One semester of anatomy, physiology, pharmacology, or some other health-related elective.

That would leave a reasonable amount of room for electives in the arts, humanities, and social sciences. But the point of the report is that there are many other course configurations one could draw up that would satisfy the competencies: the key is the content, not the course title. Ideally, if the report's recommendations are adopted, colleges and their students would be freed from the tyranny of the rigid premed curriculum and be able to experiment with innovative and exciting ways of combining material, including experiential learning, that would do the job.

"In the end, we produced something as close to a consensus as 22 people of disparate backgrounds and philosophies could ever be expected to produce."

Of course, for any of this to happen, the MCAT, which currently requires students to know a lot of facts that are irrelevant to medical school education (Grignard reactions; inclined plane problems), would need to be revamped. The good news is that it is probably going to happen. In the fall of 2008, the AAMC began a comprehensive review of the MCAT, called MR5. The 21-member review committee was charged with recommending changes that are likely to increase the MCAT exam's value to medical school admissions committees. In conducting their review, committee members were directed to consider recent calls for new information about the applicants' mastery of natural science content; behavioral and social sciences and humanities content; and professional competencies like cultural competence, communication skills, and professionalism. MR5 committee members are seeking input on the new exam at meetings and conference sessions, through surveys and other information-gathering activities, and from experts working on related issues. Our report is intended to inform the deliberations of the MR5 Committee, and people involved with formulating the MCAT were present at some of our sessions. A new MCAT test will be introduced no earlier than 2013, so there is time for you to comment on that as well as on our report. For additional information, go to www.aamc.org/mr5.

Medical school biochemistry departments may feel nervous about our recommendations because if all students arrive at medical school with a full year of biochemistry under their belts, why would those schools need biochemistry faculty? Our intent is not to make medical school biochemists redundant; rather, it is to free them from having to teach what amounts to remedial college biochemistry, a subject that most first year medical students find either repetitive or largely irrelevant, and instead to allow them to teach the exciting and relevant areas of their discipline at a higher level. That will require some curriculum changes, but what's so bad about that?

I taught freshman chemistry to premedical students almost continuously for 30 years. I could have taught my last year of the subject from the same notes, using the same tests that I used in the first year I taught it, because what the medical schools required their entering students to know hadn't changed significantly in three decades. That isn't right. Doctors don't just need to know science, they need to be able to think like scientists; yet we have devised a medical education system so antiquated, burdened with requirements, and geared toward memorization of facts that many would-be physicians say the science courses are the things they hate the most. Do we really want the subjects we love to be nothing but an obstacle course for the physicians of tomorrow? Or do we want a modern, exciting, science-driven program that is focused on making sure that doctors really know what they need to know?

So, fellow biochemists,
Please heed the call.
We must change what we teach,
For we can't teach it all.
And the status quo's
Long overdue for a fall;
Our curriculum
Needs rearrangin'.
Come along down the new road,
You just might have a ball—
For the times, they are a changin'.

FASEB Publications Explore Bone Grafting and NIH Funding

BY CARRIE D. WOLINETZ

FASEB recently announced the release of the publication "Bone Builders: The Science of Grafts, Biomaterials, and Bone Engineering," the latest article in the "Breakthroughs in Bioscience" series. This series is a collection of illustrated articles, published by FASEB, that explain recent developments in basic biomedical research and how they are important to society. FASEB distributes the articles, free of charge, to members of Congress, patient advocacy groups, educational organizations, members of the press, and research advocacy partners. We highly encourage members of the FASEB societies to use these materials in their own advocacy and education activities. The entire series is available online (opa.faseb.org/pages/Publications/breakthroughs.htm) or in hardcopy form by contacting the FASEB Office of Public Affairs (opa.faseb.org).

Recent titles in the series have included:

- Building Electronic Bridges to Bionics: The Basic Science of Neural Prosthetics
- Viruses, Cancer, Warts, and All: The HPV Vaccine for Cervical Cancer
- Breathtaking Discoveries: How Basic Research Led to Treatments for Asthma
- Science, Serotonin, and Sadness: The Biology of Antidepressants
- Breast Cancer, Tamoxifen, and Beyond: Estrogen and Estrogen Receptors
- Finding Chinks in the Viral Armor: Influenza, AIDS, and Antiviral Therapies

The most recent article in the series explores the development of modern day biomaterials used for bone grafting and gives a glimpse into cutting-edge regenerative medicine and bone tissue engineering. After blood transfusions, bone is the most commonly transplanted tissue: every year, more than 800,000 people in the U.S. receive bone biomaterials, including bone grafts and bone substitutes. Scientists have taken their cues from fundamental physiology and even sea coral to develop replacements for bone. Serendipitous research discoveries and breakthroughs involving multiple scientific disciplines have led to remarkable advancements in bone grafting and bone biomaterials and has formed the foundation for the emerging field of bone engineering. Readers will learn about the science of bone grafting, several natural materials that played a key role in the search for bone graft substitutes, and the future of bone engineering as a result of breakthroughs in biomedical research. FASEB expects to publish the next article in the series, on monoclonal antibody therapies, by late summer, to be followed by an article on angiogenesis by the end of the year.

FASEB has also released a new report titled "Investing in Our Future: A Stronger NIH for a Healthier America." The report explores the impact of "boom and bust" cycles for funding biomedical research and makes the case for predictable, sustainable funding increases for NIH. In this context, the publication outlines a path to avoid the looming "cliff" following expiration of the funds made possible through the American Recovery and Reinvestment Act (ARRA). The report was released at a press event introducing ASBMB member Mark O. Lively, Ph.D. as the new president of FASEB and can be found at: http://opa.faseb.org/pages/Publications.

Carrie D. Wolinetz is Director of Scientific Affairs and Public Relations for the Office of Public Affairs at FASEB. She can be contacted at cwolinetz@faseb.org.

NSF Boosts Diverse Basic Research

BY ALLEN DODSON

What do Google and NASCAR have in common? Both organizations have benefitted from the National Science Foundation. A 1994 NSF grant to Stanford University students Sergey Brin and Larry Page led to the founding of their prominent search engine company four years later. Meanwhile, NSF continues working to harness the power of online streaming video for science outreach. Their latest effort, in collaboration with NASCAR, is an online video series about the physics behind the pursuit of the checkered flag on the race track. The project aims to expose young race fans, the potential entrepreneurs of the future, and older enthusiasts, who may not have been in a science classroom in decades, to the role that science plays in everyday life.

The Value of a Diverse Research Portfolio

The National Science Foundation provides 69 percent of federal funding for non-biomedical basic research at academic institutions. The NSF Directorate for Biological Sciences (BIO) supported the recent sequencing of the corn genome, along with work on microbial fuel cells and climate research. However, NSF's impact on biomedical research goes far beyond the $655 million budget for research and related activities at NSF BIO in 2009.

NSF plays an even larger role in the funding of other disciplines, providing 84 percent of federal support for academic basic research in computer science, 63 percent of federal support for mathematics, and 45 percent of federal support for engineering. This is reflected in the diverse research featured on the NSF website such as advances in quantum computing and emergent magnetism.

This type of basic research lays the groundwork for new technologies that will one day become common tools for biomedical researchers. For example, NSF-funded material scientists at Massachusetts Institute of Technology (MIT) announced last year that they had developed polymer "backpacks." These synthetic patches can be attached to cells and used to carry therapeutic compounds to the site of treatment. The scientists believe that the technology could also be used to align cells in specific patterns for tissue engineering. These future applications, for research, treatment of patients, and consumer products, are possible through investment in the NSF.

NSF has also been pushing for an increased focus on interdisciplinary projects. Since 1999, the agency has had a collaboration with NIH to study the ecology of infectious diseases—an increasingly important area in the context of incidents like the recent swine flu outbreak. The NSF budget proposal for 2010 includes increased collaborations both inside and outside of the NSF, including an increased focus on biosensor technology, energy, and climate change.

Funding Outlook

Though no budget outlook is certain until the president signs a final bill into law, the NSF's position appears to be strong. The agency received $3 billion in one-time stimulus funding through ARRA, the American Recovery and Reinvestment Act of 2008. Though this increase, like NIH's share of the ARRA package, is temporary, NSF has focused on planning for a softer landing at the end of the stimulus period, shifting costs for one-time expenditures away from the regular budget and into the stimulus package where possible.

Perhaps more importantly, NSF appears to enjoy support across Washington. The Obama administration, like the Bush administration before it, has requested significant growth for the NSF budget. The multiyear plan would increase funding to twice the 2006 level over the next eight years. This time, however, there may also be support in Congress. On June 18, the House passed an appropriations bill that would give the agency a $6.9 billion budget in fiscal year 2010. If agreed to by the Senate, this would represent a 6.8 percent increase in the budget. This increase would be very similar to the number requested by the administration and would provide a solid down payment on continued, and hopefully sustained, growth for the agency.

ASBMB has been keeping a close eye on the NSF and is working to ensure that the agency continues to receive the funds it needs to lay the groundwork for the breakthroughs of the future.

Allen Dodson is an ASBMB Science Policy Fellow. He can be reached at adodson@asbmb.org.

Congress Moves to Increase SBIR Set-Aside

BY PETER FARNHAM

Amidst small business advocates' accusations of foul play committed by the National Institutes of Health, the House and Senate began an effort in June to increase the percentage of federal research funds to be "set aside" to support small businesses. The set-aside, currently at 2.5 percent of all Federal R&D funds, would increase under Senate legislation to 3.5 percent.

To give some idea of the magnitude of the sums this represents, consider NIH's base budget (excluding $10 billion in stimulus funding the agency received in March) of approximately $30 billion. A simple calculation indicates that currently, with no increase in the set-aside, approximately $750 million is spent on the SBIR program, along with a smaller and closely related program, the Small Business Technology Transfer (STTR) program. A 1 percent increase would increase the amount of the set-aside to approximately $1 billion.

This is the first major effort to increase the size of the set-aside percentage since 2007, when advocates sought a doubling of the size of the SBIR/STTR programs. Now, with the vociferous support of the small business community, bills are moving in both the House and Senate.

The Senate Committee on Small Business and Entrepreneurship unanimously passed the SBIR/STTR Reauthorization Act of 2009 (S 1233). The proposal increases the SBIR allocation from 2.5 percent to 3.5 percent. (There is no change to the STTR program.) The bill is expected to pass by voice vote in the full Senate.

However, in the House, the two committees sharing jurisdiction over the program—the Committee on Science and Technology and the Committee on Small Business—both passed the Enhancing Small Business Research and Innovation Act of 2009 (HR2965) in late June that did *not* include an increase in the SBIR set-aside.

Floor action on both bills is pending but is expected after the 4th of July recess.

Backlash against NIH

To give an idea of the sort of tactics being used to push this legislation, consider these excerpts from an action alert sent to members of the National Small Business Association:

"Small technology-based companies that access the Small Business Innovation Research (SBIR) Program—and all those that believe in fairness for small business in federal contracting—should write to their senators and representatives about the recent maneuvering by the National Institutes of Health (NIH). NIH essentially tricked Congress into preventing small companies in the SBIR Program from accessing the agency's $8.2 billion R&D windfall in the economic stimulus bill. In other words, having free rein over 97.5 percent of the $8.2 billion wasn't enough for NIH. They had to keep small business from getting even 2.5 percent through SBIR.

"Despite the fact that small companies employ more U.S. scientists and engineers (38 percent) than large companies (27 percent) or universities (16 percent), they still receive only 4.3 percent of federal R&D dollars, and SBIR accounts for more than half of that.

"Small companies also create 60-80 percent of all net new jobs each year—which should make small business the focus of an economic stimulus bill and not an excluded element.

"NIH repeatedly told Congress that it opposed increasing the 2.5 percent allocation for small business because small business would always 'get more as the agency's budget increases.' Now the agency has stealthily excluded small business from its biggest R&D budget increase in a decade.

"The fact that NIH resorted to concealing the small business exclusion in an obscure legal phrase buried deep in the 1,000-page bill suggests that the agency does not think it could win this argument on the merits. It also suggests a considerable degree of hypocrisy in NIH's public statements in support of small business."

Science Community Opposed to Increase

The science community in general, including ASBMB, FASEB, and most of the other life sciences societies, is opposed to an increase in the set-aside for a variety of reasons. First, it is in fact accurate to state that as NIH's budget increases, the amount of money set aside for small business will increase as well. It would thus behoove all stakeholders in NIH, regardless of whether they are small businesses or not, to work to increase the overall size of the

NIH budget, rather than fight over pieces of it. As FASEB put it in a letter to the full House and Senate:

"We recognize the benefits of the participation of small businesses in scientific research. However, a mandatory increase in the SBIR allocation across agencies will necessarily result in funding cuts for the peer-reviewed research conducted by other organizations. This fundamental research creates the discoveries that fuel innovation, improve quality of life, and contribute to our country's economic growth. Indeed, the increase in the SBIR allocation proposed in S 1233 will restrict competition for $1 billion in federal research dollars, during a time when future funding levels are uncertain. Rather than increasing support for one type of research at the expense of all others, we urge Congress to work with the Obama Administration to increase funding for all research, thereby increasing the total investment in SBIR."

We also note that Presidential Science Advisor John Holdren wrote to Senator Mary Landrieu (D-LA), chair of the Senate Small Business committee, opposing a set-aside increase. He stated that "the current budget set-asides of 2.5 percent for SBIR and 0.3 percent for STTR for all federally funded extramural research provide a sufficient floor for agencies to invest in innovation from small business."

ASBMB supported the FASEB letter opposing the increase, but the Public Affairs Advisory Committee is considering what can be done to develop a better model for creating incentives for private development and application of biomedical discovery research. It might be a good time to take a long, thoughtful look at the SBIR program, with an eye to measuring its effectiveness before any increase is proposed. As always, ASBMB values your input and advice on these complex matters. Please feel free to send comments to the ASBMB Office of Public Affairs care of Peter Farnham, Director of Public Affairs, who can be reached at pfarnham@asbmb.org.

June Advocacy Workshop at UTHSCSA a Big Success

BY PETER FARNHAM

Peter Farnham (*middle*), Lauren Gross (*second from right*), and C. Ainsley Davis (*far right*) visited with graduate students at the University of Texas Health Sciences Center at San Antonio to teach them about lobbying.

Advocacy for science and for policies that support and encourage it are very important and should be a lifelong component of the career of any scientist. This was the overall message of a workshop on advocacy held this past June at the University of Texas Health Sciences Center, San Antonio.

The workshop, titled "Communicating with Politicians—the Do's and Don'ts of Becoming Involved in Advocacy and Scientific Policy," was the second of four sessions, all of which were part of an overall program entitled, "Communicating Science: A Road to Success." The sessions, held during June and July, were aimed at graduate students and postdocs.

Bettie Sue Masters, one of the co-organizers, is a Past-President of ASBMB and a current member of the Society's Public Affairs Advisory Committee. She also served a term as FASEB's Vice President for Science Policy. "I strongly encourage my students to become advocates for science," she told *ASBMB Today*, "and this workshop was a step toward trying to create a lifelong appreciation for the value of the work."

Session speakers included Masters; Ellen Kraig, an immunologist at UTHSCSA; Peter Farnham, ASBMB's Director of Public Affairs; and Lauren Gross, the Association of American Immunologist's Director of Public Policy and Government Affairs. Following the brief talks, the session ended with two brief training skits. The first skit showed a meeting in which a Texas "Senator" (played by Farnham) had just about every mistake inflicted on him that a constituent could make in a face-to-face meeting. Fortunately, no tape or photo of this aspect of the session is known to exist! The skit was followed, however, by a second, in which the meeting was conducted properly. Farnham and Gross had breakfast the next morning with a small group of students for further informal discussion.

In addition to presentations about the role of advocacy in formulating public policy, the session also gave students an appreciation of how important it is to join a professional society. Many professional societies engage in advocacy activities and thus can assist members in getting involved. In turn, members can help their professional societies—and their scientific fields—by participating in advocacy.

If anyone is interested in putting on a similar event at their school, the ASBMB Public Affairs staff is always available to assist or conduct workshops at your institution. Please contact Peter Farnham, director of Public Affairs, at pfarnham@asbmb.org for more information.

Denu to Lead Group at UW

John M. Denu, a professor of biomolecular chemistry in the University of Wisconsin-Madison School of Medicine and Public Health, has been selected to lead a section on epigenetics at the new Wisconsin Institute for Discovery at the University of Wisconsin-Madison.

Epigenetics refers to changes in phenotype or gene expression caused by mechanisms other than changes in the underlying DNA sequence. Denu explains that epigenetic research is not only important to our understanding of a fundamental process in science, but it should also help researchers develop new strategies to fight diseases.

The new institute centers around five core themes: tissue engineering scaffold research; health technology design in the living environments laboratory; optimization in biology and medicine; systems biology, an integrated, "system level" understanding of living organisms; and epigenetics. Theme leaders will take up occupancy in the new building upon its completion in December 2010.

"I expect this will be a hotbed for new ideas and new directions," said John D. Wiley, interim institute director. "We want it to be a real catalyst for energizing the whole campus."

Lively Becomes President of FASEB

Mark O. Lively assumed office as the 94th president of the Federation of American Societies for Experimental Biology on July 1, 2009. Lively is a professor of biochemistry at Wake Forest University, as well as the Director of the Molecular Genetics Program and Director of the Biomolecular Resource Laboratory. He will serve for one year as the leader of FASEB, a coalition of 22 member societies comprising more than 90,000 biomedical research scientists.

"This is a critical time for the biomedical sciences and for science policy, and FASEB will continue to provide a strong voice for working scientists," Lively stated. "While our primary focus remains educating policymakers about the importance of research funding, I expect we will be addressing a number of other important policy issues during my term, from challenges to the humane use of animals in research to development of conflict-of-interest regulations to biosecurity proposals related to select agents."

Lively is a protein chemist with a long-standing interest in proteolytic enzymes and protein structure and function. The primary focus of his laboratory is the cellular roles and mechanisms of catalysis of novel proteolytic enzymes involved in the processing and secretion of proteins from eukaryotic cells. A major objective is to describe the enzymatic mechanism of microsomal signal peptidase, an endopeptidase of the endoplasmic reticulum that is an essential component of the biosynthetic pathway of most secretory proteins.

Massagué Wins BBVA Foundation and AACR Awards

Joan Massagué, chairman of the Cancer Biology and Genetics Program at the Memorial Sloan-Kettering Cancer Center, is the recipient of the first BBVA Foundation Frontiers of Knowledge Award in Biomedicine and the American Association for Cancer Research's 2009 G.H.A. Clowes Memorial Award.

The Frontiers of Knowledge Awards are intended to recognize and encourage world-class research and artistic creation, prizing contributions of lasting impact for their originality, theoretical significance, and ability to push back the frontiers of the known world. These international awards span eight categories: Basic Sciences (Physics, Chemistry, and Mathematics), Biomedicine, Ecology and Conservation Biology, Information and Communication Technologies, Economics, Finance and Management, Contemporary Music, Climate Change, and Development Cooperation. Massagué received his award for his research on the fundamental processes that control cell division.

The AACR Clowes Award recognizes an individual with outstanding recent accomplishments in basic cancer research. Massagué was honored for a series of discoveries made over more than two decades that defined the mechanisms by which signals initiated by transforming growth factor-β (TGF-β) are conveyed from their receptors on the cell membrane to the nucleus to affect cell proliferation, differentiation, and cancer. He was also recognized for his recent studies, which identified genes that define metastatic tissue tropism, providing a firm genetic basis for understanding the ability of breast cancer cells to colonize either the lung or bone.

Massagué is also adjunct director of the Institute for Research in Biomedicine in Barcelona and an Investigator of the Howard Hughes Medical Institute.

Matthews Elected to the American Philosophical Society

Rowena G. Matthews, G. Robert Greenberg distinguished university professor emeritus and research professor emeritus in the Life Sciences Institute at the University of Michigan, has been elected to the American Philosophical Society (APS), the oldest learned society in the United States.

The APS was founded in 1743 by Benjamin Franklin to promote useful knowledge in the sciences and humanities. It carries out that mandate by supporting excellence in scholarly research, professional meetings, publications, library resources, and community outreach. The Society has played an important role in American cultural and intellectual life for more than 250 years. Today the Society has 987 elected members: 821 resident members, and 166 international members from more than two dozen foreign countries. Matthews is one of 35 new members elected to the society this year.

Matthew's current research interests focus on studies of the mechanisms of enzymes that use folic acid as a cofactor. In particular, her laboratory focuses on methylenetetrahydrofolate reductase, cobalamin-dependent methionine synthase, and cobalamin-independent methionine synthase.

Guilfoyle and Hagen Receive Life Membership Award

GUILFOYLE

HAGEN

Thomas Guilfoyle, professor, and his longtime research partner and wife, Gretchen Hagen, research professor, both with the Division of Biochemistry at the University of Missouri, received the Charles Reid Barnes Life Membership Award from the American Society of Plant Biologists (ASPB).

The award, which recognizes meritorious work in the field of plant biology by an individual who is at least 60 years old, was given to Guilfoyle and Hagen for their pioneering work on how auxin controls gene transcription and expression in plants. This is the first time the award has been bestowed to a research team.

The Membership Award is the ASPB's oldest award, established in 1925 at the first annual meeting of the society through the generosity of Charles A. Shull. It honors Charles Reid Barnes, the first professor of plant physiology at the University of Chicago and it provides a life membership in the Society.

PHOTO CREDIT: INTERDISCIPLINARY PLANT GROUP, UNIVERSITY OF MISSOURI.

Olson Awarded Lefoulon-Delalande Foundation Grand Prize

Eric Olson, chairman of molecular biology at the University of Texas Southwestern Medical Center, has been awarded the Institut de France's Lefoulon-Delalande Foundation Grand Prize for his work on gene regulation in the cardiovascular system.

The prize has an international reputation as the most prestigious award in cardiovascular research. The award of about $664,000 (500,000 euros) was presented to Olson this past June in France by French Prime Minister Francois Fillon and the president of the Institut de France.

Much of what is known about cardiac gene regulation can be traced directly to Olson's pioneering work. His research is regarded as a major step in finding genetic targets for treatment of congenital heart defects and adult heart disease, and it has illuminated the fundamental principles of organ formation. Equally important is his demonstration that many of the genes that control heart formation are called into play in the adult heart under pathological stress.

Olson studies how the heart and blood vessels form, how they rebuild themselves after injury, and how genetic mutations and stress can cause heart disease. He and his team have discovered networks of genes that orchestrate the formation of the heart and have shown how inherited genetic mutations in these genes cause congenital heart disease, the most frequent form of birth defect.

Coleman Wins Shaw Prize

Jackson Laboratory Professor Emeritus Douglas Coleman will share the 2009 Shaw Prize in Life Science and Medicine with Jeffrey Friedman of Rockefeller University and the Howard Hughes Medical Institute. The prize, issued by the Shaw Prize Foundation of Hong Kong, is widely regarded as the "Nobel of the East" and carries a $1 million award.

In the 1970s, Coleman conducted a series of experiments that led him to propose the existence of a "satiety factor" that would account for obesity and type 2 diabetes among certain mice. Friedman would later identify that factor as leptin, a hormone that regulates food intake and body weight. The scientists' work showed that chemical and genetic factors—not just willpower and eating habits—are involved in obesity, opening possibilities for future pharmaceutical treatments.

Established by Chinese movie executive and philanthropist Run Run Shaw, the Shaw Prize "honors individuals, regardless of race, nationality and religious belief, who have achieved significant breakthroughs in academic and scientific research or application and whose work has resulted in a positive and profound impact on mankind."

ASBMB Announces 2009 Election Results

After some very close races, the ASBMB polls closed on June 26 and the votes were tallied for the 2009 election. Our new society president for 2010 will be Suzanne R. Pfeffer. Merle S. Olson will continue as Treasurer, and Ruma V. Banerjee and Benjamin F. Cravatt will join the ASBMB Council. New committee members include Karen N. Allen (Nominating Committee), Richard L. Eckert and Lee Gehrke (Public Affairs Advisory Committee), and Charles Brenner (Publications Committee). Maurine E. Linder will serve a second term on the Publications Committee. All terms begin on July 1, 2009, except for the president's, which will commence on July 1, 2010. (Pfeffer will serve as president-elect from 2009 to 2010.)

President

Suzanne R. Pfeffer

is currently a professor in the biochemistry department at the Stanford University School of Medicine. She received her A.B. in biochemistry from the University of California, Berkeley and her Ph.D. in biochemistry and biophysics from the University of California, San Francisco. She has been a member of ASBMB since 1990 and served on the Society Council from 2005 to 2008. Pfeffer's current research looks at the regulation of receptor trafficking by small GTPases and their effectors.

Treasurer

Merle S. Olson

is a professor emeritus in the Graduate School of Biomedical Sciences at the University of Texas Health Science Center. He received his B.A. from St. Olaf College and his Ph.D. from the University of Minnesota, Minneapolis. Olson has been a member of the Society since 1973 and has served as ASBMB Treasurer since 2006. His research program is concerned with the regulation of multi-enzyme complexes and cell signaling by lipid and peptide mediators.

Council Member

Ruma V. Banerjee

is the Vincent Massey Collegiate Professor of Biological Chemistry as well as the associate chair of the Department of Biological Chemistry at the University of Michigan. She earned her B.S. from Delhi University and her Ph.D. from Rensselaer Polytechnic Institute. Banerjee served on the ASBMB Publications Committee from 2005 to 2008 and has been a Society member since 1987. Her research aims to elucidate the structure and function of B12 enzymes and chaperones, as well as the chemical biology of mammalian sulfur and redox metabolism and H2S biogenesis.

Council Member

Benjamin F. Cravatt

is professor and chair of the Department of Chemical Physiology at The Skaggs Institute for Chemical Biology. He received his B.A. in history and his B.S. in biological sciences from Stanford University and his Ph.D. from The Scripps Research Institute. He was co-organizer (with Michael Rosen) of the 2007 ASBMB Annual Meeting and has been an ASBMB member since 2001. Cravatt's research is directed toward mapping biochemical pathways in mammalian biology and disease by activity-based proteomics and metabolomics. He also studies the enzymatic regulation of endocannabinoid signaling.

Nominating Committee

Karen N. Allen

is a professor in the Department of Physiology and Biophysics at the Boston University School of Medicine. She attended Tufts University, where she earned her B.S., and Brandeis University, where she earned her Ph.D. in biochemistry. The current focus of her research is the evolution, chemical and catalytic mechanism, and inhibitor design of phosphotransferases, decarboxylases, aldolases, and metalloproteases.

Public Affairs Advisory Committee

Richard L. Eckert

is a professor and chair of the Department of Biochemistry and Molecular Biology at the University of Maryland School of Medicine. He received his B.A. from the University of Wisconsin and his Ph.D. in physiology and biophysics from the University of Illinois. Eckert has been a member of ASBMB since 1988. His research looks at polycomb genes, epigenetics, cell differentiation, survival signaling, gene expression, MAPK signaling, stem cell biology, and tumor suppressors.

Public Affairs Advisory Committee

Lee Gehrke

is the Hermann von Helmholtz Professor of Health Sciences and Technology at the Massachusetts Institute of Technology as well as a professor of Microbiology and Molecular Genetics at the Harvard Medical School. He received his B.S. from Eastern Illinois University and his Ph.D. in anatomy and developmental genetics from Case Western Reserve University. Gehrke joined ASBMB in 1990. His research interests center on the pathogenesis of RNA viruses and on RNA structure function.

Publications Committee

Maurine E. Linder

is a professor of cell biology and physiology in the Division of Biology and Biomedical Sciences at Washington University School of Medicine in St. Louis. She is also Chair Designate in the Department of Molecular Medicine at the College of Veterinary Medicine at Cornell University. Linder earned her B.S. from Michigan State University and her Ph.D. in molecular cell biology from the University of Texas at Dallas. She has been a member of the Society since 1992 and has served on the ASBMB publications committee since 2006. Her research concerns the biology and enzymology of protein palmitoylation in cell signaling and protein trafficking.

Publications Committee

Charles Brenner

is professor and head of the Biochemistry Department at Dartmouth Medical School. He received his B.A. from Wesleyan University and his Ph.D. in cancer biology from Stanford University. He has been a member of ASBMB since 1996. Brenner's research program looks at the function of histidine triad proteins, the pathways for translational and post-translational control of the cell cycle, and NAD metabolism as related to aging.

We thank the following outgoing Council and committee members for their service to the Society:

Heidi E. Hamm
Past President

Alan Hall
Council Member

John D. Scott
Council Member

Kevin Struhl
Council Member

Garry Dotson
Minority Affairs Committee

George Hill
Minority Affairs Committee

Jerome Nwachukwu
Minority Affairs Committee

Jennifer A. Doudna
Nominating Committee

Ronald R. Bach
Public Affairs Advisory Committee

David S. Eisenberg
Public Affairs Advisory Committee

Frederick Grinnell
Public Affairs Advisory Committee

Linda Van Aelst
Public Affairs Advisory Committee

Dennis R. Dean
Publications Committee

New Education Guidelines for Future Physicians

BY NICOLE KRESGE

For the past several decades, scores of students have been able to satisfy medical school requirements by taking a pre-approved checklist of courses. However, things could be changing in the not-too-distant future if the recommendations in a recent report are taken to heart. In short, satisfying a dynamic set of competencies rather than a static list of courses may become the new basis for medical school acceptance.

While the scientific knowledge necessary for practicing medicine has changed dramatically over time, the approach to premedical and medical education has essentially stayed the same. To address this inconsistency, in 2007 the Association of American Medical Colleges (AAMC) and the Howard Hughes Medical Institute (HHMI) assembled a committee of 22 scientists, physicians, and science educators from institutions around the United States, including ASBMB President Gregory Petsko and Past-president Judith Bond. They tasked this Scientific Foundations for Future Physicians (SFFP) Committee with examining the natural science competencies that a graduating physician would need to practice science-based medicine effectively.

This past June, the committee issued their findings in a report titled "Scientific Foundations for Future Physicians." The report offers 11 overarching principles to help guide educators in their discussions to define competencies, recommends eight natural sciences competencies that all medical students should demonstrate before receiving their M.D. degrees, and identifies eight broad scientific competencies that individuals should master before entering medical school. Competencies are defined as the knowledge, skill, or attitude that enables an individual to learn and perform in medical practice.

For example, instead of requiring specific mathematics courses, pre-medical students would need to be able to "apply quantitative reasoning and appropriate mathematics to describe or explain phenomena in the natural world." Medical students, on the other hand, would be expected to show competence in applying "quantitative knowledge and reasoning—including integration of data, modeling, computation, and analysis—and informatics tools to diagnostic and therapeutic clinical decision making." Similarly, instead of a series of chemistry courses, pre-medical students would need to "demonstrate knowledge of basic principles of chemistry and some of their applications to the understanding of living systems." Medical students would be required to "apply major principles of physics and chemistry to explain normal biology, the pathobiology of significant diseases, and the mechanism of action of major technologies used in the prevention, diagnosis, and treatment of disease." The report also supplements the competencies with specific learning objectives and examples.

An important point to note is that the committee did not recommend that the number of requirements be increased for students. Rather, it proposed substituting more relevant requirements for less relevant ones.

The Committee believes that its recommendations will encourage the development of innovative and interdisciplinary science curricula, maintain scientific rigor, and allow pre-medical students at the undergraduate level the flexibility to pursue a strong liberal arts education.

The report's findings will be considered in the AAMC's comprehensive review of the MCAT, which is currently underway. Expected to be completed by 2012, this review will assess the test's current content and recommend changes that are likely to increase its usefulness to the medical school admissions process. In addition, a separate report on the behavioral and social science competencies for future physicians is expected in late 2010.

"This report is timely and important. Science has always been the foundation of modern medicine, but today, science is moving forward with increasing speed at new and ever-expanding interfaces," said Peter J. Bruns, HHMI's vice president for grants and special programs. "The report will help pre-medical and medical educators design the curricula needed to arm aspiring and developing physicians with the scientific knowledge they will need today and the intellectual attitudes that will sustain them in the future."

A downloadable PDF of the report is available at www.hhmi.org/grants/sffp.html and www.aamc.org/scientific-foundations.

JBC Minireview Series Explores Metals in Biology

BY NICK ZAGORSKI

When you consider the elements important for biological activity, the words that first come to mind are carbon, oxygen, nitrogen, and phosphorous. Yet life as we know it would not exist if not for metals, elements traditionally associated with inorganic chemistry. Whether used for processes such as electron transfer (*e.g.* iron in ferredoxins) or enzyme catalysis (*e.g.* magnesium in DNA polymerases), the electrophilic nature of metal ions makes them indispensible components of countless proteins.

As a result, deficiencies in cellular metal content are associated with a host of health concerns, such as anemia and Menkes disease. Of course, the same properties that make metals vital nutrients also make them potentially harmful, and excess concentrations of many metals can lead to the production of toxic reactive oxygen species, DNA damage, and other serious problems; therefore, it's vital that the free concentrations of metals in cells be tightly regulated.

This year, the *Journal of Biological Chemistry* brought attention to these important biological necessities in a pair of thematic minireview series entitled "Metals in Biology" and "Metals in Biology II." Coordinated by *JBC* associate editor F. Peter Guengerich (Vanderbilt University School of Medicine), this two-part series includes reviews on metals ranging from the well-known (iron) to the obscure (vanadium).

The first "Metals in Biology" series appeared in the January 9 issue of *JBC* and is available for purchase as a compendium (www.jbc.org/thematics/metal/). The series features three articles on metals in health and disease.

The first minireview in the series, by An-Sheng Zhang and Caroline Enns, deals with some recently identified proteins involved in iron homeostasis, particularly those that regulate the peptide hepcidin in the liver, and how they relate to physiological states such as hypoxia and inflammation. The second minireview, by Michelle Turski and Dennis Thiele, discusses some general mechanisms for eukaryotic copper metabolism, noting recent discoveries that have identified potential new functions for copper metabolism proteins in cell signaling, gene expression, tumor cell metastasis, and resistance to anti-cancer agents. The third minireview involves selenium, an essential micronutrient that is a component of the amino acid variant selenocysteine. In their review, Jun Lu and Arne Holmgren discuss the biosynthesis, structure, and diverse activity of selenoproteins.

The second thematic series, which appeared in the July 10 issue of *JBC,* contains five minireviews and is available for purchase at www.jbc.org/thematics/metal2.

In the first, Jaclyn Winter and Bradley Moore examine the chemistry and biology of vanadium-dependent haloperoxidases in fungi and algae and also note new enzyme discoveries in bacteria that extend the biological function of these enzymes. Leonidas Platanias explores the different biological responses of cells to arsenic compounds, which can range from therapeutic to toxic. John Shanklin, Girish Mishra, Jodie Guy, and Ylva Lindqvist team up for a review of desaturases, enzymes that perform O_2-dependent dehydrogenations with the use of a diiron active site. David Eide discusses studies in yeast that have answered questions about how cells maintain zinc homeostasis as well as how they adapt should zinc levels dip to low levels. And last, but certainly not least, Stephen Ragsdale offers a review of the eight known nickel-based enzyme systems, touching on the extensive variety seen in their metal centers.

Nick Zagorski is a science writer for ASBMB. He can be reached at nzagorski@asbmb.org.

Updating the *MCP* Proteomic Publication Guidelines

BY ROBERT J. CHALKLEY, KARL R. CLAUSER, AND STEVEN A. CARR

Mass spectrometry (MS)-based proteomics identifies peptides, proteins, and post-translational modifications by acquiring mass spectral data (MS and tandem MS (MS/MS) spectra) and then analyzing the results using database-searching software and associated statistical tools. Modern mass spectrometers allow analysis of large numbers of components in a short period of time, and the new instrumentation has led to an explosion in proteomic research and data production.

The amount of data produced is too vast to allow manual interpretation or complete presentation, so software is required to understand and condense the results. Several years ago, it was realized that authors of proteomics papers would benefit from guidelines defining information that had to be submitted as part of a manuscript to allow adequate assessment of reported protein identification and analysis results.

Molecular & Cellular Proteomics (*MCP*) has taken a leading role in developing such community guidelines. In 2004, an initial set of guidelines[1] was drafted from discussions among members of the journal's editorial board. A year later, at a meeting in Paris, a more complete set of guidelines[2] was compiled by a panel of about 30 international experts in the application and analysis of proteomic data. These guidelines, which have become known as the Paris Guidelines,[3] set a benchmark for assessing proteomic manuscript content. *MCP* has enforced these guidelines for all germane manuscript submissions to the journal and other journals either recommend these same guidelines or have their own variations.[4] The guidelines have generally been well received by the community, and it is widely felt that they have led to an improvement in quality and accountability of published results.

However, as with all rapidly developing scientific fields, new approaches and techniques are constantly being devised in proteomics. As such, it was recently acknowledged that the guidelines needed to be updated to reflect new experimental practices. There was also a growing recognition that, despite the tremendous expansion of proteomics into all aspects of biological and clinical research, very little of the data was being made publicly available for data mining, comparison of methods, and software development and refinement.

To address these issues, a one-day meeting was convened this past May in Philadelphia, immediately prior to the American Society for Mass Spectrometry annual conference. The goal of the meeting was to produce an updated set of guidelines. The meeting, organized by *MCP* Associate Editor Steven A. Carr and editorial board members Robert J. Chalkley and Karl R. Clauser, brought together about 25 proteomics scientists to discuss the current guideline's weaknesses and how the guidelines should be altered to account for new experimental practices.

> **"In general, there was an encouraging level of concordance on how the guidelines needed to be changed."**

To initiate debate and set the stage for writing the revised guidelines, attendees spent the morning in informal presentations that highlighted aspects of the current guidelines that needed revision and proposed new guidelines driven by the changes that have occurred in the field over the past four years. This was followed by an afternoon session in which four breakout groups worked on rewriting the following specific elements of the guidelines: protein identification, post-translational modifications, quantitation, and use of repositories.

In general, there was an encouraging level of concordance on how the guidelines needed to be changed. However, two areas in particular were identified as needing discussion and reworking. The first was quantitation data. In 2005, quantitative proteomic analysis was in its infancy, and, as a result, it contained a very limited number of techniques. In 2009, the research landscape is very different; quantification information is being sought in many studies, and the

Approximately 25 proteomics scientists met in Philadelphia this past May to update *MCP*'s proteomic publication guidelines.

range of techniques being used for extracting abundance measurements has broadened considerably. Of particular note is the now common use of methods that do not involve isotopic labeling. These strategies allow easier (and cheaper) sample preparation and data acquisition but present increased challenges in verifying the accuracy and reliability of measurements.

The second area was the role online repositories play in supporting results in manuscripts. This topic was also discussed at a National Cancer Institute-sponsored meeting last August[5] (and reviewed in the November 2008 issue of *ASBMB Today*). Although data repositories did exist in 2005, they were not suitable or robust enough to cope with large amounts of data. In addition, it was not easy to get data into the format required by the repository. However, repositories are now more user-friendly, and increasing amounts of information are submitted to these sites. The Paris Guidelines required submission of a PDF or Word document containing supporting information for certain types of identifications. Although these formats are easily read, they are not the most useful for assessing data. It is also difficult to extract information from these file types and convert them to other formats.

At the Philadelphia meeting, it was proposed that the guidelines encourage the use of online repositories and other mechanisms that make data more easily accessible and assessable. This represents a significant departure from standard *MCP* practice, where supporting information is submitted and controlled by the journal. It was also suggested that the guidelines encourage making raw data available through the use of sites like Tranche (http://tranche.proteomecommons.org), which allow deposition of files in any format.

These revised guidelines are being refined and collated and will be available for public review in the fall on the *MCP* website (http://mcponline.org). After a few months of community comment, they will be adopted by *MCP* as the new guidelines for manuscript submission to the journal.

The organizers of the meeting in Philadelphia would like to thank the following sponsors for their financial support, encouragement, and active participation in the continuing revision and application of the guidelines: Applied Biosystems, Agilent Technologies, ThermoFisher Scientific, and Waters Corporation.

Robert J. Chalkley is an assistant adjunct professor at the University of California, San Francisco and can be contacted at chalkley@cgl.ucsf.edu. Karl R. Clauser is a research scientist at the Broad Institute of the Massachusetts Institute of Technology and Harvard and can be contacted at scarr@broad.mit.edu. Steven A. Carr is director of the Proteomics Broad Institute of the Massachusetts Institute of Technology and Harvard University and can be contacted at scarr@broad.mit.edu.

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Unwinding the Process of Transcription

BY JOSEPH C. REESE AND RAYMOND C. TRIEVEL

REESE

TRIEVEL

Eukaryotic transcription is a highly regulated process that requires the spatial and temporal coordination of myriad factors for efficient synthesis of an mRNA transcript. A transcriptional cycle comprises several discrete phases, including initiation wherein RNA polymerase II (Pol II) and the basal transcription machinery are assembled at a gene's promoter, elongation during which the RNA transcript is extended and undergoes co-transcriptional processing through splicing and capping, and termination in which transcript cleavage is coupled to the cessation of transcription by Pol II. The process of eukaryotic transcription is complicated due to the packaging of the DNA template into a hierarchical structure termed chromatin that can serve as a physical barrier to transcription. The fundamental building block of chromatin is the nucleosome core particle, which is composed of two molecules each of the four core histones H2A, H2B, H3, and H4, around which the DNA is wrapped. Covalent modifications of the DNA and histones within chromatin, as well as remodeling of chromatin structure by remodeling complexes and histone chaperones, play pivotal roles in regulating transcription by Pol II. Thus, a comprehensive understanding of eukaryotic gene expression requires an appreciation of the transcriptional processes mediated by Pol II and the chromatin structure that encapsulates the DNA template.

> **"In transcription and RNA processing, events once thought to be regulated separately are, in actuality, highly coordinated."**

In the Chromatin and Transcription theme, the "Chromatin Modifications" session will survey various families of histone modifying enzymes and their contributions to regulating transcription and other genomic functions. Sharon R. Dent (University of Texas M.D. Anderson Cancer Center) will describe new functions for the yeast histone methyltransferase SET1 in mitosis and the roles of the mammalian histone acetyltransferase GCN5 in neuronal development and the maintenance of telomeres and stem cell pluripotency. Ali Shilatifard (Stowers Institute for Medical Research) will focus on the identification and characterization of distinct SET1 complexes in mammals and their regulatory roles in transcriptional activation, development, and disease pathogenesis. Finally, Raymond C. Trievel (University of Michigan) will discuss recent structural and functional studies of histone lysine methyltransferases that illuminate the mechanism by which these enzymes catalyze lysine multiple methylation.

The "Transcription Initiation and Elongation" session will include the most recent advances in this area. Three talks will highlight the integration of multiple cellular factors to achieve precise regulation of these essential steps. Robert G. Roeder (Rockefeller University) will emphasize the analysis of coactivators and general transcription factors in controlling chromatin modifications and elongation. New functions for Mediator in overcoming effects of negative regulators and the synergistic effects of elongation factors in regulating histone methyltransferases and acetyltransferases will be discussed. Steve Hahn (Fred Hutchinson Cancer Research Center) will describe his studies using biochemical probes to determine the architecture of the RNA polymerase II transcription pre-initiation complex (PIC). He will present results localizing the general transcription factor TFIIF within the PIC and activator targets within the Mediator complex. Joseph C. Reese (Pennsylvania State University) will discuss elongation regulation by a highly conserved multifaceted transcription factor complex, Ccr4-Not, implicated in regulating gene expression "from birth to death." He will describe the biochemical, genomic, and genetic analysis of this complex.

The "Chromatin Structure and Remodeling" session will explore nucleosome structure, the higher ordered states of chromatin, and the mechanisms by which this structure can be remodeled. Blaine Bartholomew (Southern Illinois University School of Medicine) will examine how chromatin remodeling factors harness the energy of ATP hydrolysis to reposition nucleosomes on DNA templates. Karolin Luger (Howard Hughes Medical Institute (HHMI)/Colorado State University) will describe the development of new assays that can quantify the thermodynamic parameters of chromatin and nucleosomal arrays and the application of these assays toward elucidating the mechanisms by which histone chaperones assemble and disassemble nucleosomes. Lastly, Vasily M. Studitsky (University of Medicine and Dentistry, New Jersey (UMDNJ)-Robert Wood Johnson Medical School) will discuss how chromatin structure and modifications are maintained during, and recovered after, transcription by Pol II.

In transcription and RNA processing, events once thought to be regulated separately are, in actuality, highly coordinated. This is the focus of the "Co-transcriptional Processing" session. The carboxyl-terminal domain (CTD) of Pol II acts as an assembly platform for many RNA processing factors. David Bentley (University of Colorado Health Sciences Center) will discuss the network of interactions between proteins that integrate transcription and mRNA maturation. Also, Katherine A. Jones (The Salk Institute) will describe novel functions of the CTD in the recruitment and regulation of chromatin remodeling activities and mRNA processing and export factors. Finally, Susana Rodríguez-Navarro (Principe Felipe Research Center) will present work on yeast Sus1, a subunit of both the SAGA coactivator and TREX2 RNA export complexes. She will describe how Sus1, and other factors, couple mRNA export to transcription and chromatin modifications.

In addition to the presentations by the invited speakers, 12 short talks will be chosen from the submitted abstracts to allow for the presentation of new and exciting results and provide a platform for the field's up and coming new investigators. We look forward to seeing you in Anaheim for what will be a very exciting and informative thematic meeting.

Joseph C. Reese is an associate professor of Biochemistry and Molecular Biology at Pennsylvania State University and can be reached at jcr8@psu.edu. Raymond C. Trievel is an associate professor of Biological Chemistry at the University of Michigan and can be reached at rtrievel@umich.edu.

Chromatin and Transcription

SYMPOSIUM: CHROMATIN MODIFICATIONS

Functions of Gcn5 in Development, *Sharon R. Dent, University of Texas M.D. Anderson Cancer Center*

Lessons Learned from Yeast about Human Leukemia, *Ali Shilatifard, Stowers Institute for Medical Research*

Molecular Mechanisms of Lysine Methylation, *Raymond C. Trievel, University of Michigan*

SYMPOSIUM: TRANSCRIPTION INITIATION AND ELONGATION

Mechanism and Regulation of Transcription Initiation, *Steve Hahn, Fred Hutchinson Cancer Research Center*

Elongation through Chromatin, *Joseph C. Reese, Pennsylvania State University*

Function of Diverse Transcriptional Coactivators in Animal Cells, *Robert G. Roeder, Rockefeller University*

SYMPOSIUM: CHROMATIN STRUCTURE AND REMODELING

Structure and Function of ATP-dependent Chromatin Remodeling Complexes, *Blaine Bartholomew, Southern Illinois University School of Medicine*

Post-translational Modifications as Regulators of Chromatin Structure and Histone Chaperone Function, *Karolin Luger, HHMI/ Colorado State University*

Mechanism of Transcription through Chromatin by RNA Polymerase II, *Vasily M. Studitsky, UMDNJ-Robert Wood Johnson Medical School*

SYMPOSIUM: CO-TRANSCRIPTIONAL PROCESSING

The RNA Polymerase II CTD and Coordination of Transcription with Pre-mRNA Processing, *David Bentley, University of Colorado Health Sciences Center*

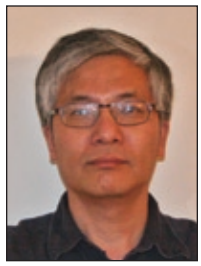
Interplay between Chromatin and RNA Processing, *Katherine A. Jones, The Salk Institute*

Sus1, a Key Factor Coupling Transcription and mRNA Export, *Susana Rodríguez-Navarro, Principe Felipe Research Center*

Mechanism and Physiological Roles of Protein Synthesis and Turnover

BY TERRI GOSS KINZY AND ZHEN-QIANG PAN

KINZY



PAN

The "Protein Synthesis, Catalysis, and Turnover" theme strives to take a fresh look at the mechanisms that play key roles in the last stages of gene expression, resulting in key changes in the levels of cellular proteins by their synthesis and turnover. In addition, the ability to assure accuracy in synthesis, folding, and the functional state of proteins affects many physiological situations. These fields may seem at cross purposes; however, as the session will show, they are linked in many ways and work in concert to balance gene expression in the cell, tissue, or organism and play key roles in cellular quality control.

The theme will begin with a session titled "Protein Synthesis: Mechanism and Regulation," which looks at the synthesis of a protein from initiation through elongation to termination. Thomas E. Dever (National Institutes of Health) will describe the elegant application of molecular genetic dissection of the translational machinery. Terri Goss Kinzy (University of Medicine and Dentistry, New Jersey (UMDNJ)-Robert Wood Johnson Medical School) will focus on the mechanism and regulation of polypeptide chain synthesis during translation elongation. This process has unique aspects in eukaryotes as a target for bacterial toxins and alternative functions aside from canonical translation. Marina Rodnina (Max Planck Institute for Biophysical Chemistry) will describe how sophisticated biophysical approaches such as kinetics, fluorescence, and FRET can enhance our understanding of the quality control mechanisms in protein synthesis. Rodnina and co-workers have established kinetic models for shared and unique characteristics of bacterial and eukaryotic translation.

Protein Synthesis, Catalysis, and Turnover

SYMPOSIUM: PROTEIN SYNTHESIS: MECHANISM AND REGULATION

Molecular Genetic Dissection of Translation, *Thomas E. Dever, National Institutes of Health*

Mechanism and Regulation of Translation Elongation, *Terri Goss Kinzy, UMDNJ-Robert Wood Johnson Medical School*

Quality Control Mechanisms in Protein Synthesis, *Marina Rodnina, Max Planck Institute for Biophysical Chemistry*

SYMPOSIUM: PROTEIN SYNTHESIS: TRANSLATION IN MEDICINE

Pharmacological Suppression of Nonsense Mutations to Treat Genetic Diseases, *David M. Bedwell, University of Alabama at Birmingham*

mTOR Signaling in Translation and Folding, *Estela Jacinto, UMDNJ-Robert Wood Johnson Medical School*

Translational Regulation in Breast Cancer, *Robert J. Schneider, New York University Cancer Institute*

SYMPOSIUM: PROTEIN TURNOVER: TAGGING SUBSTRATES FOR UBIQUITINATION

Mechanistic Insights into Substrate Polyubiquitination, *Zhen-Qiang Pan, Mount Sinai School of Medicine*

Deubiquitinases as Regulators of Cellular Signaling, *Vishva Dixit, Genentech, Inc.*

The Ubiquitin-Proteasome System in Metabolic Carbon Regulation and Disposal of Protein Waste: Functions and Mechanisms, *Dieter Wolf, Universität Stuttgart*

SYMPOSIUM: PROTEIN TURNOVER: FUNCTION AND REGULATION OF THE 26 S PROTEASOME

Targeting Ubiquitin Networks, *Ivan Dikic, Goethe University School of Medicine*

Signaling Pathways That Perturb Skeletal Muscle Atrophy and Hypertrophy, *David J. Glass, Novartis Institutes for BioMedical Research*

Signaling for Degradation by the Proteasome, *Kylie Walters, University of Minnesota*

The "Protein Synthesis: Translation in Medicine" session underscores how protein synthesis can serve as a drug development target and is altered in human diseases. David M. Bedwell (University of Alabama at Birmingham) will provide examples of how pharmacological suppression of nonsense mutations that inactivate gene function can be used to treat genetic diseases such as cystic fibrosis. Robert J. Schneider (New York University Cancer Institute) will discuss translational regulation in breast cancer. Schneider and co-workers have integrated cell and animal models with clinical examples of altered translation factor levels in disease states. Estela Jacinto (UMDNJ-Robert Wood Johnson Medical School) will discuss a novel function of the target of rapamycin (TOR) pathway in regulating protein folding and stability, as well as protein synthesis.

"...these four sessions provide a glimpse into the state of the art knowledge of these key steps of gene expression and promote thinking across boundaries within the topics."

The last two sessions focus on the ubiquitin-proteasome system (UPS). This process is composed of multiple steps leading to the tagging of target proteins with lysine 48-linked polyubiquitin chains and the delivery of the modified substrates to the 26 S proteasome for degradation. In the "Protein Turnover: Tagging Substrates for Ubiquitination" session, Dieter Wolf (Universität Stuttgart) will discuss how misfolded proteins of the secretory pathway are recognized by the endoplasmic reticulum (ER), retrotranslocated into the cytoplasm, and degraded by UPS. This pathway, widely known as ER-associated degradation (ERAD), is an essential cellular mechanism that ensures protein quality control. Vishva Dixit (Genentech, Inc.) will introduce his intriguing work on deubiquitinating enzymes (DUBs) and their role in cell proinflammatory signaling. DUBs catalyze the removal of ubiquitin moieties from substrates and have recently emerged as key components of the UPS regulatory network. Zhen-Qiang Pan (Mount Sinai School of Medicine) will describe reconstitution of substrate polyubiquitination, which has yielded mechanistic insights into enzymatic tagging of a substrate with lysine 48-linked polyubiquitin chains.

In the "Protein Turnover: Function and Regulation of the 26 S Proteasome" session, Ivan Dikic (Goethe University School of Medicine) will lead a discussion on how ubiquitin is recognized, mechanisms that translate the signaling power of ubiquitin to alterations of biological processes, and development of strategies to target the ubiquitin network. Kylie Walters (University of Minnesota) will explore high-resolution structural approaches to provide mechanistic understanding of the function of the proteasome to mediate the degradation of polyubiquitinated substrates. David J. Glass (Novartis Institutes for BioMedical Research) will discuss how perturbation of UPS is linked to skeletal muscle atrophy and hypertrophy.

In addition, 12 short talks will be selected from the submitted abstracts.

Altogether, these four sessions provide a glimpse into the state of the art knowledge of these key steps of gene expression and promote thinking across boundaries within the topics. The sessions will help move the fields towards an application of these areas to key questions about the pathogenic consequences of alterations in protein synthesis and turnover.

Terri Goss Kinzy is a professor in the Department of Molecular Genetics and Microbiology at the UMDNJ-Robert Wood Johnson Medical School. She can be contacted at kinzytg@umdnj.edu. Zhen-Qiang Pan is a professor of Oncological Sciences at the Mount Sinai School of Medicine and can be contacted at zhen-qiang.pan@mssm.edu.

Metabolism and Disease: Advances in Metabolomics and Nutrient Regulation of Gene Expression

BY GERALD W. HART AND JOHN M. DENU

HART

DENU

Recent advances in analytical methods, genomics, and proteomics have led to dramatic progress in our understanding of the roles of metabolic regulation in human disease and aging. In fact, the study of metabolism is trendy again! The "Metabolism and Disease" theme will present four symposia that highlight cutting-edge research in metabolomics, the regulation of metabolism by reversible protein acetylation or other modifications, nutrient regulation of transcription, and the epigenetic regulation of metabolism.

The first symposium, "Quantitative Metabolomics and Disease," will highlight approaches and advances in metabolomics, which is the simultaneous quantitative profiling of many of the cell's small molecule metabolites, reflecting the overall physiologic status of the cell. Gary Siuzdak (The Scripps Research Institute) will discuss the diagnostic power of new mass spectrometric approaches to analyze metabolites in biofluids and tissues. The application of modern metabolomic approaches to elucidate mechanisms underlying obesity and diabetes will be presented by Christopher B. Newgard (Duke University Medical Center). Anne M. Evans (Metabolon) will discuss the use of metabolomics to discover biomarkers and uncover disease mechanisms. These modern metabolomic methods are shedding new light on metabolic flux and pathway interplay in both normal and disease conditions and represent a "systems biological approach" to understanding metabolism and disease.

> **"The 'Metabolism and Disease' theme will present four symposia that highlight cutting-edge research in metabolomics, the regulation of metabolism by reversible protein acetylation or other modifications, nutrient regulation of transcription, and the epigenetic regulation of metabolism."**

The second symposium, "Sirtuins, Metabolism, and Aging" will begin with a presentation by Leonard Guarente (Massachusetts Institute of Technology) who will report on his pioneering work on mechanisms by which SIR2-related genes regulate life span and alter metabolism through calorie restriction. Marcia C. Haigis (Harvard Medical School) will present her findings on the regulation of metabolism by SIRT4, a mitochondrial ADP-ribosyltransferase that regulates insulin secretion in response to amino acids. John M. Denu (University of Wisconsin-Madison) will describe his recent work on the mechanisms and biological functions of reversible protein acetylation and its roles in modulating signal transduction, chromatin dynamics, and gene activation. This symposium will highlight the most current findings in a new and exciting area of research that is elucidating molecular mechanisms that regulate metabolism and aging.

The third symposium, "Nutrient Regulation of Signaling and Transcription," will highlight research on several different mechanisms by which nutrients regulate gene expression. Bruce M. Spiegelman (Dana-Farber Cancer Institute) will describe his work on the biochemistry and functions of the transcriptional co-activator, PGC-1α, often referred to as the "master regulator of energy metabolism." Morris J. Birnbaum (Uni-

versity of Pennsylvania School of Medicine) will present his cutting-edge work on the regulation of cellular growth and metabolism by signaling molecules, such as the protein kinases, Akt and AMP-activated protein kinase (AMPK), as well as nutrient sensors, such as the carbohydrate response element binding protein (ChREBP). Juleen R. Zierath (Karolinska Institute) will present her research on cellular mechanisms underlying the development of insulin resistance in Type 2 diabetes. Gerald W. Hart (Johns Hopkins University School of Medicine) will describe recent findings demonstrating that extensive cross-talk between phosphorylation and GlcNAcylation synergistically regulate signaling and transcription in response to nutrients and stress. This symposium highlights the many interrelated mechanisms by which cellular metabolism and gene expression are regulated by nutrients.

The fourth symposium, "Metabolism and Epigenetics," will focus on how nutrients regulate gene expression by epigenetic modifications. Dana Dolinoy (University of Michigan School of Public Health) will report on her work on nutrient and environmental epigenomics in human health and disease. Qinghong Zhang (University of Colorado, Denver) will present her novel findings with respect to an NADH-sensing transcriptional co-repressor, CtBP, that is sensitive to cellular redox status and regulates apoptosis. Paolo Sassone-Corsi (University of California, Irvine) will describe his recent findings with respect to the role of an NAD-dependent deacetylase as a regulator of CLOCK-mediated chromatin remodeling and circadian control. This symposium highlights the plasticity of epigenetic modification of chromatin and how these modifications are affected by nutrients and cellular energy status.

There will also be 12 short talks which will be selected from the submitted poster abstracts.

This four-day symposia brings together leading researchers focused on mechanisms regulating metabolism and gene expression in normal cells and in chronic disease. Cross-fertilization between these different topics should lead to lively discussions and provoke new insights.

Gerald W. Hart is DeLamar Professor and Director of Biological Chemistry at the Johns Hopkins University School of Medicine and can be contacted at gwhart@jhmi.edu. John M. Denu is a professor in the Department of Biomolecular Chemistry at the University of Wisconsin-Madison and can be contacted at jmdenu@wisc.edu.

Metabolism and Disease

SYMPOSIUM: QUANTITATIVE METABOLOMICS AND DISEASE

Recent Advances in Metabolomics in Providing Mechanistic Insight and Discovering Biochemical Markers, *Anne M. Evans, Metabolon*

Comprehensive Metabolic Analysis for Understanding of Obesity and Diabetes Mechanisms, *Christopher B. Newgard, Duke University Medical Center*

Mass-based Metabolomics of Biofluids and Tissues, *Gary Siuzdak, The Scripps Research Institute*

SYMPOSIUM: SIRTUINS, METABOLISM, AND AGING

Metabolic Regulation by Reversible Protein Acetylation, *John M. Denu, University of Wisconsin-Madison*

Sirtuins: Diseases and Aging, *Leonard Guarente, Massachusetts Institute of Technology*

Regulation of Metabolism by SIRT4, *Marcia C. Haigis, Harvard Medical School*

SYMPOSIUM: NUTRIENT REGULATION OF SIGNALING AND TRANSCRIPTION

Transcriptional Control of Adipogenesis and Energy Homeostasis, *Bruce M. Spiegelman, Dana-Farber Cancer Institute*

The Regulation of Metabolism by Akt/PKB, *Morris J. Birnbaum, University of Pennsylvania School of Medicine*

Cross-talk between GlcNAcylation and Phosphorylation Is Extensive: Roles in Nutrient Sensing and Signaling, *Gerald W. Hart, Johns Hopkins University School of Medicine*

To Be Announced, *Juleen R. Zierath, Karolinska Institute*

SYMPOSIUM: METABOLISM AND EPIGENETICS

Nutrient Epigenomics in Human Health and Disease, *Dana Dolinoy, University of Michigan School of Public Health*

NAD and Circadian Control, *Paolo Sassone-Corsi, University of California, Irvine*

CtBP, an NADH-sensing Transcriptional Co-repressor, *Qinghong Zhang, University of Colorado, Denver*

ASBMB Roundtable: **Thomas Cech**

BY NICK ZAGORSKI

Everyone hopes they can go out on top; Thomas Cech may have done just that. Since taking over the HHMI presidency in January 2000, Cech has guided this esteemed philanthropy through a decade of innovation and expansion, punctuated by the opening of HHMI's first freestanding research facility, before stepping down this past spring and passing the torch to distinguished biochemist Robert Tjian. Cech has since returned to his laboratory at the University of Colorado and is starting a new leadership chapter as director of the Colorado Initiative in Molecular Biotechnology, the university's effort to foster interdisciplinary research, teaching, and technology development. As he readies for this new challenge, Cech takes a few moments from his duties to reflect on both the past and the future.

ASBMB: ***Developing the Janelia Farm Research Campus was arguably the major initiative of your presidency; with the financial and time commitments involved, was there ever any doubt about the success of this massive endeavor?***

CECH: I think all of us who helped put Janelia Farm together had some worries. Now, I wouldn't characterize the project as a "roll of the dice" that was going to win or lose; given the resources available and the quality of people we've hired, I'm certain that scientific success will be plentiful. The interesting question has always been whether Janelia is going to end up as simply another first-class research center, like Whitehead or the Salk, or if it can be as "revolutionary" as we hope. HHMI has always tried to be different and not just incremental—that's why we fund people and not projects—and Janelia Farm will be a major test for that.

ASBMB: ***While it took many headlines, Janelia was only one aspect of your work. What were some other accomplishments you remember fondly?***

CECH: Well, one of our biggest changes was opening up the Investigator program to accept online applications, as opposed to the old system of receiving nominations from individual universities. This is valuable because it not only gives us a very rich group of candidates to choose from, but it also removes any residual traces that the Hughes Investigator program is subject to institutional bias, politics, or favoritism. On the investigator side, we also held dedicated competitions to bring in more patient-oriented physician scientists, to bolster the "Medical" aspect that is part of our name.

Another big move was substantially overhauling our educational programs. One new program I'm especially proud of is EXROP (Exceptional Research Opportunities Program), which provides underrepresented minorities and other disadvantaged groups research experience with one of our investigators, with the goal of getting them to pursue Ph.D.s; so far, EXROP has exceeded my expectations, as more than 50 percent of our students have gone on to graduate school.

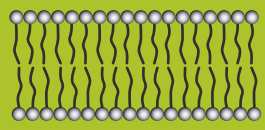
ASBMB: ***After serving for over nine years, was there any particular motivation for stepping down?***

CECH: There was no defining element; I just felt the time was right to hand over the reins and let someone with a different set of priorities take charge. I've always believed that institutions are well served by having fresh leadership on a regular basis. I advocated that same belief during our early discussions about Janelia Farm; I stressed having untenured faculty, to ensure continual scientific renewal.

ASBMB: ***And how has adjustment back to a "regular life" been? Are you excited at the chance to finally do some research again?***

CECH: Exactly; I'm also completely energized and eager about building this new program, the Colorado Initiative in Molecular Biotechnology. I jokingly tell people that it's going to be just like Janelia Farm—without the resources. So it will be challenging, but exciting, to see how the Janelia model needs to be altered in order to work at a research university where departments still tend to operate as individual silos. For example, we just hired a new faculty member from MIT, Robin Dowell, who wants to teach in computer science but maintain a wet lab in molecular biology and accept graduate students from both departments who are in different colleges. She asked if this was a problem, and we said, "Absolutely not; this is what we're trying to do."

Nick Zagorski is a science writer for ASBMB. He can be reached at nzagorski@asbmb.org.



Lipids: A New Frontier for Infectious Diseases

BY MAURIZIO DEL POETA

Throughout history, the study of lipids as structural, signaling, and regulatory molecules has never been as productive as it is today. A PubMed search reveals that the word "lipid" can be found in 15,140 abstracts published in 2008. Yet this number is much lower then those found for words like "DNA", "RNA", or "protein". We must face the facts: for most scientists, lipids are just not popular molecules. This is no surprise. We grow up with the notion that cholesterol and triglycerides are responsible for heart attacks, that there are more bad than good fatty acids, that sphingolipids cause a series of rare and fatal metabolic diseases, and that prostaglandins inflict agonizing pain. In contrast, DNA, RNA, and proteins are known for being the building blocks of life, the regulators of all biological processes, the fingerprint of who we are, and, if amino acids are transformed into music notes, they can generate "your DNA song" (see yourdnasong.com). We lipid scientists have a long way to go before reaching such glamorous attention and being able to compose "your lipid song."

"We grow up with the notion that cholesterol and triglycerides are responsible for heart attacks, that there are more bad than good fatty acids, that sphingolipids cause a series of rare and fatal metabolic diseases, and that prostaglandins inflict agonizing pain."

But, after having worked in the sphingolipid field for the last 10 years, I have come to appreciate the advantages of studying in a small field. The field appears to be invaded by "The Roseto Effect," in which the appreciation of *togetherness* and *family* exists and makes science more enjoyable. Considering my legacy, this makes perfect sense!

Even though the lipid field is relatively small, scientists are beginning to appreciate the importance of these molecules in the regulation of many biological processes. This is due mainly to the dramatic technical advances that have occurred during the last two decades in the analysis and characterization of lipids *in vitro* and *in vivo*.

One such example is the study of lipids, and in particular sphingolipids, in the development and progression of infectious diseases. We now know that most sphingolipids are essential for microbial growth. We also know they are structurally different from host sphingolipids, have different functions, are localized in different compartments, and are produced by different enzymes. We should exploit such differences in a more aggressive manner for the development of more effective diagnostic and therapeutic strategies against infectious diseases.

For instance, specific microbial surface lipids could be detected by molecular probes, visualized by imaging, and used to follow the spreading of microbial cells throughout the body. This analysis could be employed for diagnostic screening in patients at risk of developing (or already presenting clinical manifestations of) infections and as a prognostic indicator during antimicrobial therapy. Because lipids are required for microbial growth, targeting microbial sphingolipids and/or sphingolipid-metabolizing enzymes would cause microbial death, and, because they are different from those found in mammalian cells, drug toxicity should be minimal.

As the lipid field grows, I hope that it will keep the sense of togetherness and intimacy that makes it so special. I also hope that the field will attract scientists from different disciplines who will aid in elucidating the properties and functions of lipids in cellular pathobiology and how we can manipulate these molecules to improve the outcome of the disease.

Maurizio Del Poeta is a Burroughs Wellcome investigator in Pathogenesis of Infectious Diseases and an associate professor in the Department of Biochemistry and Molecular Biology at the Medical University of South Carolina in Charleston. He can be contacted at delpoeta@musc.edu.

You Ask, We Answer…

BY TAKITA FELDER-SUMTER

In science, profound findings in one field can easily be adapted to fuel the success of a seemingly unrelated field. Many of these "crossovers" are a result of intellectual discussions among people from various backgrounds, both cultural and professional, exchanging ideas to advance technology. ASBMB has a sustained commitment to this type of varied representation within the Society, and the Minority Affairs Committee (MAC) is one way that it ensures this variety. But, one question that is often asked is, "what does MAC actually do?" In response, I provide the following summary of recent MAC initiatives and accomplishments.

In my mind, MAC aims to promote the well-being of ASBMB by increasing the representation of disadvantaged and underrepresented minorities in biochemistry and molecular biology.

To do this, we host several sessions at the annual meeting to meet the scientific and professional development needs of the society's membership while also addressing many issues that disparately affect those who have historically been underrepresented in the life sciences. Our scientific sessions are an integral part of a meeting that is thematically aligned to stimulate discussions so that we all employ the most innovative approaches to advancing biochemistry and molecular biology.

> **"…MAC aims to promote the well-being of ASBMB by increasing the representation of disadvantaged and underrepresented minorities in biochemistry and molecular biology."**

We also aim to increase the visibility of underrepresented minorities within the society in an effort to provide a forum for the exchange of information and ideas among scientists from industry, academics, and government. The number of underrepresented minorities and women nominated for ASBMB awards has increased as a result of our work on this initiative. We also urge you to nominate deserving women and underrepresented groups for these awards.

MAC also provides opportunities for networking and mentoring at a variety of ASBMB events and sponsors the Minority Scientist's Mixer held every year during the annual meeting.

We also work to stimulate an early interest among students, particularly those from underrepresented groups, in scientific careers and those subjects vital to a career in the life sciences. We co-sponsor the Society's undergraduate poster competition where the number and quality of the undergraduate research presentations continue to increase. Our active participation in meetings like the Society for Advancement of Chicanos and Native Americans in Science (SACNAS) National Conference and the Annual Biomedical Research Conference for Minority Students (ABRCMS), where the nation's most talented underrepresented minority research students present their work, has resulted in an increase in undergraduate student memberships in ASBMB. Many of these highly motivated young scientists are in search of undergraduate research opportunities outside of their home institutions and when possible, we match these students with a research mentor.

MAC represents minority biochemists and molecular biologists on a variety of levels within the ASBMB. We network with other MAC organizations within and outside of the Federal Association of Scientists and Experimental Biologists (FASEB) to provide the appropriate leadership, assistance, and expertise in all areas related to minority affairs.

I hope you will join us in our efforts to cultivate and enhance the intellectual fertility of our society. Think about attending a future MAC luncheon or scientific session during the annual meeting.

As we continue to serve the society, we would also like to hear from you. Currently, we are developing a registry of biochemists and molecular biologists that will be used to more effectively advance our goals. Please help us by registering at www.asbmb.org/MACRegistry.

Takita Felder-Sumter is an assistant professor of chemistry at Winthrop University and a member of the ASBMB Minority Affairs Committee. She can be contacted at sumtert@winthrop.edu.

Boost Your Postdoctoral Career

BY FABIAN V. FILIPP

In his role as director of the Center for Cancer Training at the National Cancer Institute, Jonathan S. Wiest has incorporated the recommendations of the National Academies' Committee on Science, Engineering, and Public Policy (COSEPUP) and the Convocation on Enhancing the Postdoctoral Experience for Scientists and Engineers. Below, are excerpts from an interview in which Wiest provides tips on how to make the best of your postdoctoral experience.

1. Take control of your career

Postdoctoral training is the time to focus on *your* career. If you want to follow an academic career track, it is a time to spread your wings and demonstrate your independence. It is not only a time to grow up scientifically but also a time to explore other career directions.

2. Find what drives you

A postdoctoral fellowship is not so much about identifying what skills you might already have in place; it is more about trying to identify what drives you and what you are passionate about. Or in other words, if work is your hobby, you'll never be bored!

3. Build independence

You build your independent career path stepwise as a young scientist. In this process you have to get buy-in from the people you are working with. You need to have honest, open communication that starts by looking at the end and then working backwards. So if you want to be an independent scientist when you leave the laboratory, it is best to talk about that when you start your postdoc.

4. Communicate with your coworkers

Among scientists, it is important to communicate in a productive and easy way. It is a waste of energy if you have to work to have a conversation with somebody about their project. This doesn't mean that you can't discuss difficult topics. Also, remember that group dynamics are very important.

5. Leverage resources

In addition to your scientific training, you need to have access to other career resources. Again, think about the end and work backwards: if you need expert knowledge in technology transfer, grant writing, or science administration, what opportunities can your institution provide to give you hands-on experience?

Jonathan S. Wiest gives some tips to postdocs at the National Postdoctoral Association Annual Meeting.

6. Explore your options

Even though "alternative career paths" are now called "jobs for the 21st century," many people still do not regard them as successful pursuits for postdocs. We have to change the scientific culture so that people don't see a career as a tenure track investigator as the only positive outcome for a postdoc. First, academia is not a realistic career choice for everyone, and second it might not be a good fit. If you are thinking about shifting your career it is very important to get hands-on experience. Fortunately many institutions have established partnerships with federal agencies where people can learn about other career paths.

7. Hold tight in difficult funding periods

The funding process has always been an up-and-down roller coaster. In times of bad funding you have to look for other sources of money like private foundations, professional societies, institutional funds, and do whatever else you can to keep your research programs going. Sometimes you have to scale back, but it is important to keep moving forward, so that when things do rebound, you still are in a good position.

8. Follow through... and get noticed

Do things that you like to do, do good work, and follow through—people will notice that. When your institution or committee leaders ask you for help and you actually do help out and make a positive impact, then it will get noticed, and it can help you advance your career.

Fabian V. Filipp is a postdoctoral fellow at the Burnham Institute of Medical Research and president of the University of California Council of Postdoctoral Scholars. He can be contacted at filipp@burnham.org.

Shedding Light on Microscopy

BY JOSEPH BRZOSTOWSKI

I work at NIH, and I manage a light microscopy facility for the Laboratory of Immunogenetics (LIG) in the National Institute of Allergy and Infectious Diseases (NIAID). My official title is "staff scientist (core)." Whereas most institutes have large core facility groups to meet the needs of their researchers, I run a small facility to service the members of LIG at our satellite location off of the main NIH campus.

I love my job, and I feel very lucky to have found it. This is not to say that I didn't have growing pains and had to make realistic compromises when I first arrived, but now, I think I have a science dream job—partly because I worked it out that way for myself, but mostly because I have a terrific boss who provides me with a lot of flexibility and has yet to say "no" to my sometimes not-so-modest proposals.

In general, a staff scientist at NIH works for an investigator to support the research that takes place in the investigator's section. (In NIAID, the laboratories, *e.g.* LIG, are similar to departments at a university and sections, run by tenured or tenure-track investigators, are the equivalent of individual department labs). There is no set formula: some staff scientists will manage a lab, others will only focus on a specific research question, or it can be a combination of duties. I work for the chief of the laboratory (akin to a department head at a university), and my primary responsibility is to the researchers in all the sections of LIG. In a practical sense, this means I drop what I am doing to help when there is a problem with the microscopes in the facility. Despite having been here now for nearly four years, the job still feels relatively new to me. Although some things have become routine (and that is a good thing), the facility keeps growing and changing, so the work remains fresh. Admittedly, I am busier than I ever was as a postdoc, and this makes me feel valued by the folks I work with.

So what do I do? The answer depends on which of two caps I might be wearing. Because I head the facility (to keep it in perspective for you, I currently manage just myself), my first cap says "Service." If I let it, this hat could keep me busy full time. I manage four imaging systems used by just over 20 scientists, and I'm in the planning/gathering stages to build two additional systems. For better *and* worse, I have an open design philosophy with our systems (except for the workhorse confocal microscope), which means that I continually make modifications to help researchers ask specific questions. In addition, having sophisticated/complicated instrumentation means I spend a considerable amount of time training new users and helping experienced users avoid the modifications I made. I have also accumulated an extensive tool kit to fix or replace the parts that get broken. I am not an electrician or an optical engineer by training, but I am not afraid to take an instrument apart, even though it can be as expensive as a Ferrari. More times than not, this foolhardiness has saved time and has kept the instruments running. (It's certainly entertaining to have an Ohm meter in hand and a mobile phone crooked on a shoulder while doing my best to hear the answers to my questions over the din of a gas laser, "Did you say that I should be reading 250 volts direct current, and don't touch what?" At least I didn't need the soldering iron that day.) An imaging facility is not complete without analysis computers and software. My office is nestled among seven computer workstations in a large open office cubicle. I find this open design to be quite rewarding as it accommodates conversation and collaboration among

Brzostowski

Joseph Brzostowski is a staff scientist at the National Institute of Allergy and Infectious Diseases. He runs a microscopy facility for the Laboratory of Immunogenetics at the Twinbrook Campus in Rockville, Maryland. Brzostowski received his undergraduate degree in biochemistry from Rutgers College and his Ph.D. from the University of Virginia. He trained as a postdoctoral fellow at the National Institute of Diabetes and Digestive and Kidney Diseases where he began his studies on cell signaling and chemotaxis.

the researchers in our group. Plus, it means I am never lonely.

My other cap says "Researcher." While I love to tinker with the equipment, it's really the process of answering the biological questions that I enjoy the most. What attracted me to this position was that I would be allowed to pursue my own scientific interests, but my experiments would need to be executed with my own two hands. Years ago, over beer at a Gordon Research conference, I listened to a group of PIs wax on about how the postdoc is the best time in one's scientific career because research is the singular focus. Their words made me appreciate my tenure as a postdoc, but I didn't truly understand what they lamented until I tried to model my research activities in my new position as if I were still a postdoc. My time wasn't mine any more in the lab, and it took some effort to get over this.

What *has* been working quite wonderfully are my collaborations with scientists inside and outside of LIG. These efforts have resulted in three research papers and three book chapters (several first author) since I started in 2005. I must admit that I am a new believer in team science. Postdocs on the hunt for an academic slot usually need to be cautious about shared authorship because the goal is to distinguish her/himself and to establish a niche; therefore, I tread carefully with my collaborative projects. Teamwork can have great benefits because expert skill sets can be capitalized upon to quickly reach a project's goal. However, it only works as long as the lines between projects are discussed clearly and continually from the beginning of the collaboration.

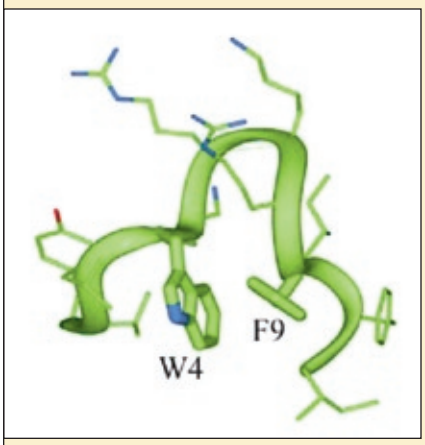
What kind of personality do you need for a position such as mine? At its root, my position is a service-oriented one. If you are considering a job in a facility, you must be honest with yourself when you evaluate how well you play with others, how much you like to teach, and how effectively you can manage a multiuse facility. The fact-of-life here is that equipment fails, people break equipment either unknowingly or carelessly, and your time is not your own. If you do not have the patience to deal with such issues, then this is not the job for you.

> **"If you are considering a job in a facility, you must be honest with yourself when you evaluate how well you play with others, how much you like to teach, and how effectively you can manage a multiuse facility."**

Finally, how did I get here? Unfortunately, I don't have magical insight into how to land a facility job such as mine except to tell you this: talk to as many people as you can and let them know that you are looking for a career path beyond university professor. While obvious, it is surprising that many young scientists-in-training don't know what it means to network or use "informational interviews." Despite being over a decade past the appearance of that awful catchphrase "alternative-career-in-science," the negative connotations associated with it still prevents postdoctoral fellows from having open conversations with their mentors and peers. My heart has always been in academic science. When I was ready to apply to faculty positions around the country, my wife landed her Washington, D.C.-located dream job. (She's the deputy director of a small science museum.) We agreed at the time that I should still apply for faculty positions to generate options, but I also talked to several NIH staff scientists about their jobs and, out of my networking, came this marvelous opportunity.

Bactericidal Boomerangs

Lipopolysaccharide (LPS), a major component of the outer membrane of Gram-negative bacteria, is perhaps best recognized as a potent inducer of the innate immune system. However, LPS also acts as a barrier to exogenous compounds and a chaperone to aid in the folding of outer membrane proteins. Therefore, molecular interactions with LPS should be considered when designing antimicrobial drugs. In this study, the researchers do just that, describing structure-activity correlations for a series of 12-residue peptides (derived from chemokines and neutrophil bactericides) in LPS. They observed that long-range aromatic-aromatic packing between residues located at positions 4 and 9 (forming a boomerang-like conformation) was crucial for both neutralizing LPS and antimicrobial activity; the ability of these active peptides to neutralize LPS appeared to correlate with their ability to perturb LPS micelles. This atomic-level knowledge should be useful in providing the building blocks for designing novel peptides for bacterial outer membranes.



Model representing the average conformer of peptide YI12WF in LPS, highlighting the "boomerang" structure critical for efficient antimicrobial activity.

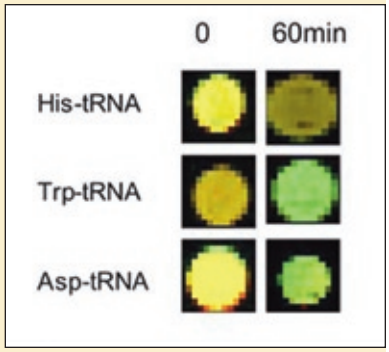
Designed β-Boomerang Antiendotoxic and Antimicrobial Peptides: Structures and Activities in Lipopolysaccharide

Anirban Bhunia, Harini Mohanram, Prerna N. Domadia, Jaume Torres, and Surajit Bhattacharjya

J. Biol. Chem., published online June 10, 2009

jbc

A tRNA Response Code



Microarray analysis shows that multiple tRNAs are deacylated in response to 60 min of tryptophan starvation (*green*, decreased tRNA charging; *yellow*, no change).

During times of nutritional stress, the general amino acid control (GAAC) pathway activates to slow down protein synthesis and conserve valuable resources while the cell tries to alleviate stress. In the case of amino acid deprivation, it is believed that the accumulation of uncharged tRNA molecules for the particular amino acid may be the signal that activates the GAAC via the kinase Gcn2p. In this study, the authors used an inventive approach of yeast tRNA microarrays to analyze genome-wide changes in tRNA charging in response to histidine, leucine, or tryptophan starvation. As expected, for each limiting amino acid there was a rapid deacylation of the cognate tRNA in the auxotrophic yeast strain, coincident with phosphorylation of the Gcn2p substrate eIF2α. However, the authors also observed deacylation of tRNAs not linked with the limiting amino acid. In addition, high salinity, a stress not directly linked to nutritional deprivation, enhanced the deacylation of Met and Cys tRNAs. Together, this study suggests a complex relationship between the levels of charged/uncharged tRNAs and the cellular stress response, perhaps identifying a metabolic response code similar to the genetic code.

Genome-wide Analysis of tRNA Charging and Activation of the eIF2 Kinase Gcn2p

John M. Zaborske, Jana Narasimhan, Li Jiang, Sheree A. Wek, Kimberly A. Dittmar, Florien Freimoser, Tao Pan, and Ronald C. Wek

J. Biol. Chem., published online June 13, 2009

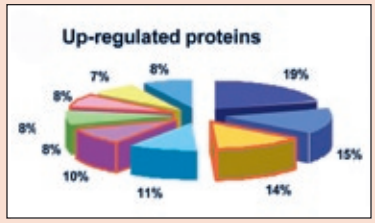
jbc

JLR Begins Thematic Review Series on Bile Acids

Produced by the liver from cholesterol, bile acids play key roles in fat breakdown and cholesterol homeostasis. Starting this month, a new thematic series will highlight these important biological compounds. The series' first review, in August, will discuss bile acids as activators of specific nuclear receptors and their involvement in cell signaling pathways in liver and gastrointestinal tract cells. The review will also profile two major hepatic bile acid biosynthetic pathways, as well as the enterohepatic circulation of bile and bile acid-stimulated synthesis of fibroblast growth factor (FGF) 15/19. The second review, in September, will look at the role of bile acids in regulating apoptosis. When certain bile acids are present in high concentrations, they can precipitate some forms of liver disease and colon cancer, while other bile acids have been observed to have cytoprotective properties, leading to potential uses as therapeutic agents.
The October review will examine the regulation of bile acid levels through bile acid synthesis pathways, particularly considering the role of nuclear receptors in regulating synthesis, farnesoid X receptor (FXR) regulation of enterohepatic circulation of bile acids, and how bile acids induce FGF 19 in hepatocytes.
The November review will look at how peroxisomes are involved in bile acid synthesis and how they relate to the observed phenotypes of patients with various peroxisomal disorders; toxicity of abnormal bile acid buildup in these patients will also be discussed, as well as possible treatments for those afflicted with peroxisomal disorders.

J. Lipid Res., publishing in August-December 2009

A MANGO Smoothie



Annotation of the biological processes of the 39 proteins up-regulated in PC12 cells by NGF.

Mass spectrometry (MS)-based quantitative proteomics (*e.g.* iTRAQ and SILAC) are well-suited for the comprehensive analysis of biological phenomena; however, their use in elucidating biological and functional processes has been difficult due the limits of software, biological databases, and validation standards. In this study, the researchers aimed at overcoming these hurdles by designing a three-step, sequential proteomic strategy that includes a gene ontology tool called Molecular Annotation by Gene Ontology (MANGO). They tested their design's ability to identify proteins related to neuronal differentiation in NGF-treated pheochromocytoma (PC12) cells. They identified 72 differentially expressed proteins (39 up- and 33 down-regulated), including 64 novel NGF-responsive PC12 proteins. The up-regulated proteins were primarily related to processes such as cell morphogenesis, apoptosis/survival, and cell differentiation, and further biochemical analyses validated the importance of these novel proteins. The researchers believe that their sequential framework could be a simple yet effective strategy for identifying proteins involved in a physiological phenomenon of interest and may soon become a standard method to elucidate the functions of proteins involved in cellular biological processes, to study the pathogenesis of various diseases, and to discover new drug candidates.

An Integrated Approach of Differential Mass Spectrometry and Gene Ontology Analysis Identified Novel Proteins Regulating Neuronal Differentiation and Survival

Daiki Kobayashi, Jiro Kumagai, Takashi Morikawa, Masayo Wilson-Morifuji, Anthony Wilson, Atsushi Irie, and Norie Araki

Mol. Cell. Proteomics, published online June 13, 2009

Janelia Farm: Sowing the Seeds…

BY NICK ZAGORSKI

It all started with a simple question: "What more can we do?"

That was the conundrum facing Thomas Cech when he left his research lab at the University of Colorado to take over the presidency of the Howard Hughes Medical Institute (HHMI) in 2000. To those familiar with HHMI, it may seem like a rhetorical question. After all, HHMI is already one the largest philanthropies in the U.S. (currently, they provide over $750 million annually to support scientific research and education), while the distinction of being named an HHMI Investigator remains one of the most prestigious honors in the scientific research community.

Yet Cech, a longtime HHMI Investigator himself who shared the 1989 Nobel Prize in Chemistry for his discovery of ribozymes, believed the Institute could not just keep holding steady and that it needed to pursue other opportunities. "I remember when I interviewed for the HHMI position in 1999, I specifically asked the trustees whether they saw the president strictly as a caretaker for the Investigator program, in which case I told them, 'It's a fine job, just not the job for me.'"

Gerald Rubin, an internationally renowned *Drosophila* biologist and John D. MacArthur professor of Genetics at Berkeley until Cech recruited him to serve as vice president of biomedical research, agreed with this assessment. "Since I had been first appointed in 1987, the HHMI Investigator program had grown from around 150 to over 300 talented individuals," says Rubin, who oversaw the appointment and review of HHMI Investigators in his role as vice president. "And it felt as though the program had reached a scientific plateau. While we certainly could have continued to increase the number of awards as our endowment grew, we realized this process would eventually be subject to the law of diminishing returns."

HHMI's trustees also agreed, and soon Cech, Rubin, and David Clayton, also brought onboard by Cech as vice president of science operations, came up with a bold vision: to develop a private, free-standing research institute that encompassed the intellectual and social culture of HHMI.

A view of the Janelia Farm front façade, overlooking a small pond and walking path.

An institute where scientists from diverse fields could be brought together and, free from the typical constraints of academia or industry, create a true scientific community that could push forward the boundaries of research. This vision began modestly enough—rough sketches drawn on the back of a napkin by Clayton as the three new leaders shared an informal conversation over dinner in 1999. Now, a decade later, the vision is complete, in the shape of a $500 million research complex tucked in a slope along the banks of the Potomac River. The vision is Janelia Farm.

The ultimate in open lab space: Janelia's prodigious use of glass (known as a structurally glazed system) creates an inviting atmosphere and astounding exterior views.

From the moment you hear the "whoosh" of the automatic doors closing as you enter the building, you know you're not visiting a typical research institute. Whether it's standing on the imported Italian flooring (similar stones can be found on the floor of the Vatican) and overlooking the spacious, sculpture-adorned lobby, walking along the elegantly curved facade while eyeing the landscaped roofing, or even hanging out at Bob's Place—the on-site pub named for HHMI's architect, Robert McGee, who worked closely with the internationally known architect Rafael Viñoly on the building design—in the afternoon and enjoying the complimentary coffee, one gets the sense that the Janelia Farm Research Campus, located within 689 wooded acres in Ashburn, VA, is unique.

Rubin, who took charge of the planning and construction details and now serves as director of Janelia Farm, will tell you that this place is anything but unique. "There's no research method or environment that hasn't been tried before, and likewise, there's no concept within these halls that I couldn't tell you where we borrowed it from," he says of this center that now celebrates its third birthday. (Though the official groundbreaking was in October 2006, the first experiments—a true determinant in a scientist's eyes—were carried out that August.) As an example, he notes that Janelia hosts scientific meetings every summer to bring like-minded researchers together, which is directly inspired by the Cold Spring Harbor summer conferences. So, it's not any individual component that makes Janelia Farm stand out; the revolutionary aspect of this center comes from the sum of its parts, each one put in place to further the progressive philosophy that HHMI abides by.

While Rubin examined the successes and shortcomings of numerous places for ideas, he honed in particularly on two places as ideal models: AT&T Bell labs in New Jersey and the Medical Research Council Laboratory of Molecular Biology (MRC) in Cambridge, where Rubin conducted his own graduate studies. While both places appear different in many respects (physics *versus* biology research, thousands *versus* hundreds of employees, and private *versus* public funding at Bell Labs and MRC, respectively), they both shared a key finality: a disproportionately large scientific output relative to their size.

When Rubin looked a little closer, he found additional similarities in three key areas. The first was lab size; MRC groups were generally around five or six people, while Bell Labs limited individual groups to only two. (Though Rubin notes if you were a Nobel winner they might give you a third.) Second, tenure was either limited or nonexistent; each year, Bell Labs jettisoned the weakest 10 percent of their group leaders while MRC scientists typically moved on to universities after 5–10 years. Third, research and support needs were all internally funded; says Clayton, "the

scientists could focus on the road ahead and let someone else worry about filling the potholes."

All told, these three characteristics drove great research because they forced all lab members including the heads to be highly active and collaborative, they only attracted people who were not risk-adverse, and they removed all the external barriers that inhibit time at the bench. And as an amateur historian and anthropologist, Rubin knows this combination has worked since ancient times: "all you need to do is create a culture that embraces creativity and collegiality, and is supportive of tackling the hard problems that are blocking progress, and great ideas will emerge."

Of course, Rubin points out one catch. "The MRC and Bell Labs I looked at were historical models, as they operated 30 years ago." By the 1980s, he says, the break-up of AT&T brought on by an anti-trust lawsuit had eroded Bell Labs' funding while MRC began to decline due to forced tenure and increased competition for talent in Europe. "So, while some current institutes come close, no one fully fits this model anymore," Rubin says. "However, if anyone had the capabilities to attempt such an endeavor again, it was HHMI. It would undoubtedly be a risk, but we definitely saw an opening to create someplace special."

Reaping the Harvest

By the time he received his Ph.D., Luke Lavis had experienced both sides of the "traditional" coin. After completing his undergraduate studies in chemistry at Oregon State University, Lavis began working in industry and fell in love with fluorescence. However, he was somewhat frustrated with the inability to pursue interesting questions or problems. "We would develop a robust assay, fashion a kit, and then move on to the next project," he says. So after three years, he applied to graduate school at the University of Wisconsin and studied chemical biology. He actually considered going back into industry once he finished, but heard about Janelia from a friend and applied on a whim...in his case, like many others, whimsy was rewarded.

Fresh from his efforts in leading the *Drosophila* genome project, Janelia Farm director Gerald Rubin was a guiding force in planning HHMI's ambitious endeavor to create its own free-standing research facility. PHOTO: PAUL FETTERS

For Lavis, the initial selling point had been Janelia's research mission. "This had been a tricky subject for us," recalls Rubin, "because we wanted to find a research area that was conducive to both interdisciplinary studies and technology development. Also, since the Janelia community would be small (once full, the campus will contain about 230 researchers and 100 technical and support staff), the research focus had to be narrow but at the same time broad enough to attract a wide range of backgrounds including biology, chemistry, physics, and computer science." The solution was to hold a series of interactive workshops, each organized by current HHMI investigators and other leading scientists; essentially, a scientific audition.

After hearing interesting talks on topics like "Perception & Behavior," "Membranes & Membrane Proteins," and "Single Cell Biochemistry," the Janelia leadership identified two complementary and synergistic areas: identifying how neurons process information, and developing new technologies for biological image analysis. This twin bill was perfect for Lavis. "When I was completing my Ph.D., I was torn whether to keep pursuing more biology or go into high-end imaging," Lavis says. "Now I've found a place where I can do both and use my chemistry background to boot."

Lavis arrived last year as one of Janelia's resident Fellows, one of the two research tracks available. The first are the Group Leaders, who are the Janelia equivalent of external HHMI Investigators; they are appointed to five-year terms with reappointment subject to rigorous review. Leaders oversee labs of up to six people, which can include research assistants, post-docs, and students (Janelia has worked out Ph.D. agreements with the University of Chicago and Cambridge University), though they also do bench work themselves. "Take Bruce Baker, for example," Rubin says. "He's a National Academy of Sciences member with almost four decades of research into *Drosophila* development and sexual behavior under his belt, yet you would be hard pressed to find anyone here putting in more hours at the bench than him."

While Group Leaders will generally attract the same caliber of scientists as faculty at prestigious universities, the Fellows position gives scientists of all stages a chance at the Janelia experience; whether it's freshly minted Ph.D.'s like Lavis who

ASBMB Mini-Bio: David Clayton

While Janelia Farm may focus on neurobiology and high-tech imaging, that doesn't mean this campus can't be home to good old-fashioned biochemistry and molecular biology. (And whether they come as visitors or prospective resident members, Janelia welcomes researchers in all aspects of science.) ASBMB member David Clayton, formerly an HHMI vice president and chief scientific officer who stepped down last summer to spend more time in his Janelia lab, is one shining example.

Janelia Group Leader David Clayton is studying mitochondrial genome organization and its links to neurological disorders.

Historically, Clayton has been a pioneer in studying mitochondrial DNA (mtDNA); while a professor at Stanford, Clayton's group was one of the first to identify the structure, sequence, physical properties, sites of transcription, and the transcription machinery (including his most shocking discovery that mitochondrial RNA polymerase was not akin to bacterial polymerases, as the endosymbiotic hypothesis would suggest, but instead homologous to bacteriophage T7 polymerase) of these small vestiges of history.

These days, Clayton hopes to take advantage of Janelia's imaging capabilities to look at mitochondrial genome organization in cells; unlike the jellybean-shaped structures found in many textbooks, mitochondria typically exist as spaghetti-like tubes that, due to frequent fission and fusion, often contain multiple copies of mtDNA per tubule. With the aid of Janelia-developed PALM (Photactivated Localization Microscopy) technology, which can discern particles only 25 nm apart to produce super high-resolution images, he has found that multiple copies of mtDNA tend to coalesce in discrete locations along with protein machinery, thus creating distinct "mitochondrial activity centers."

For the neuronal side of things, Clayton notes that mitochondrial dysfunction is becoming more and more associated with pathologies that affect brain circuitry, such as Parkinsonism, schizophrenia, or bipolar disorder (not surprising considering neurons are copious energy users), and these mitochondrial activity centers could prove quite relevant in understanding and treating these diseases.

can use this position in lieu of a traditional postdoc, young faculty who may wish to try a new research direction, or even senior scientists who want to get their hands dirty one last time before retiring. While their labs are limited to two people, Fellows otherwise are fully independent lab heads much like group leaders, though their five-year appointments are non-renewable. (They are welcome to apply to become Group Leaders, however.)

Lavis is not thinking too hard about his future yet; the present is exciting enough. As a simple explanation of his goals, he says, "I'm trying to make probes better and trying to make better probes." He notes that fluorescent dyes have been studied since the early days of organic chemistry, but researchers today still use antiquated methods. He hopes to use modern approaches to revamp dye chemistry. He's also trying to improve techniques to activate dyes with light or enzymes, as well improving their delivery to living brain and other tissue, since industries have optimized most current fluorescent tags for use in cell culture (that's where the money is).

"Everything I do has to benefit someone else here on campus," Lavis says in describing his Janelia mindset. "So it

creates a difficult balancing act. I can't just go off with my own personal agenda, but at the same time, I'm not here to act as fluorescence tech support for my colleagues. But that doesn't take away from this experience; I get to work in a lab every day while also learning how to manage a small group. So no matter where I go next, industry, academia, or here—I'll be prepared."

Perhaps a better testament to Janelia, or any locale, is not how they treat their hosts, but how they treat their guests. Since last August, Tzumin Lee, an associate professor of neurobiology at the University of Massachusetts Medical School, has been a guest of Janelia Farm—and he couldn't be happier. "This is a great place to be a visiting scientist," he says. "We just have to provide the ideas, and Janelia provides all the rest."

For Lee, his visit is a chance to team up with Rubin and other "fly people" to begin mapping the adult *Drosophila* brain. (Being well-studied and genetically tractable, *Drosophila* is a favorite model organism here, though yeast, nematodes, dragonflies, salamanders, mice, and rats are also used.) Lee had previously developed a genetic system known as Mosaic Analysis with a Repressible Cell Marker (MARCM), which can visualize neurons at single-cell levels as well as identify their developmental fate. While this approach has been used in small-scale studies, Lee hopes Janelia's talent and resources will enable a far more ambitious plan, a complete lineage map of all 30,000 neurons in the central brain of an adult *Drosophila*. "I would like to contribute to the effort on this campus to determine how many unique neuron types flies have, along with their developmental origin, function, and connectivity," Lee says.

It's an undertaking of tremendous scope, but one that well exemplifies the kinds of questions Janelia was designed to ask. "It's not just that to understand brain circuitry you need to have expertise in more approaches that any individual lab can train for," says Lee. "The sheer volume of required data alone calls for a group effort." It also highlights the fact that visiting scientists like Lee can be instrumental in advancing research, as they continually bring in fresh ideas and enthusiasm.

The idea of researchers like Lee going on sabbatical leave to learn at other institutes is certainly nothing new, but it's a process that can fail to reach its full potential. Primarily, this is because the people who may most benefit from a new lab experience, students and postdocs, often do not get to go along with the principal investigator. "After all, no university would spend money to bring in an outside researcher and half his lab and let them use their resources for a year," Rubin says. In this regard, Rubin saw a great untapped niche, and from the outset decided that visiting scientists would be critical to Janelia's success.

To encourage as much visitation as possible, Janelia Farm set up an extremely flexible program, open to all. Prospective visitors can stay for a few weeks or over a year, they can work with a specific investigator or use a specific technology, and they are welcome to bring one or two members of their lab. Janelia Farm will supply lab and office space, full access to shared facilities, and even on-site housing ranging from studio apartments to family townhomes. All they ask in return is that the visitors actively participate in Janelia's collaborative atmosphere during their stay.

In the case of Lee, that stay will be extended for at least five more years, as he was recruited to become a new Janelia group leader starting this month; his one-year visit was designed to give Lee an in-depth look at life at Janelia and serve as a way to transition his lab should he decide to accept, which he was pleased to do. Of course, he points out that HHMI has created such a dynamic environment at the Janelia campus—with people continually coming and going—that not much really has changed. "I'm not viewing this as a new job," he says. "I'm just staying for a longer visit."

Their individual paths leading to Janelia Farm may have been quite different, but as they celebrate their one year anniversaries at this research center, Luke Lavis and Tzumin Lee have a similar outlook on the road ahead; both of them will tell you that Janelia is indeed someplace special.

Nick Zagorski is a science writer for ASBMB. He can be reached at nzagorski@asbmb.org

What's in a Name?

While "Janelia Farm" conjures up many bad, though fitting, puns such as "a place where science can truly be *cultivated*" or "a center that contains all the top researchers *in the field*," the origin of this institute's name is a fitting reminder of the history of the site. The campus property was originally a farmstead, and the owners, Vinton and Robert Pickens, decided to name the farm after their two daughters, Jane and Cornelia. After HHMI purchased the land, they decided to keep this nomenclature, both to preserve this historic site (the original manor house still stands on the property) and allow the center to be broad in its research pursuits (as opposed to a restrictive title like the "So-and-So Center for Neurobiology"); the countless agrarian metaphors are just a bonus.

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scientific meeting calendar

AUGUST 2009

3rd EU Summer School in Proteomic Basics: Protein Modification and Quantification
AUGUST 2–8, 2009
SOUTH TYROL, ITALY
www.proteomic-basics.eu

21st IUBMB and 12th FAOBMB International Congress of Biochemistry and Molecular Biology
AUGUST 2–7, 2009
SHANGHAI, CHINA
www.iubmb-faobmb2009.cn/iubmb/page/index.jsp#

11th International Congress on Amino Acids, Peptides, and Proteins
AUGUST 3–7, 2009
VIENNA, AUSTRIA
www.meduniwien.ac.at/ICAAP09

Student-centered Education in the Molecular Life Sciences: Essentials for Educating Biochemistry and Molecular Biology Undergraduates
AUGUST 5–8, 2009
COLORADO SPRINGS, CO
www.asbmb.org/meetings

Gordon Research Conference: Molecular, Biophysical, & Biomechanical Understanding of Skin Barrier Formation, Function, & Disease
AUGUST 9–14, 2009
WATERVILLE VALLEY, NH
www.grc.org/programs.aspx?year=2009&program=barrier

ACS Fall 2009 National Meeting & Exposition
AUGUST 16–20, 2009
WASHINGTON, D.C.
www.acs.org/meetings

Kern Aspen Lipid Conference
AUGUST 22–25, 2009
ASPEN, CO
www.uchsc.edu/kernconference

Gordon Research Conference: Mechanisms of Cell Signaling
AUGUST 23–28, 2009
OXFORD, UNITED KINGDOM
www.grc.org/programs.aspx?year=2009&program=mechcell

9th International Symposium on Mass Spectrometry in the Health and Life Sciences: Molecular and Cellular Proteomics
AUGUST 23–27, 2009
SAN FRANCISCO, CA
www.msf.ucsf.edu/symposium

18th International Mass Spectrometry Conference
AUGUST 30–SEPTEMBER 4, 2009
BREMEN, GERMANY
www.imsc-bremen-2009.de

SEPTEMBER 2009

50th International Conference on the Bioscience of Lipids
SEPTEMBER 1–5, 2009
REGENSBURG, GERMANY
www.icbl2009.de

British Atherosclerosis Society Meeting on Genetics of Complex Diseases
SEPTEMBER 17–18, 2009
CAMBRIDGE, UNITED KINGDOM
www.britathsoc.org

MWLA Annual Scientific Forum
SEPTEMBER 25–27, 2009
CINCINNATI, OH
www.lipid.org

HUPO 8th Annual World Congress
SEPTEMBER 26–30, 2009
TORONTO, CANADA
www.hupo2009.org/default.htm

World Congress on Oils and Fats and 28th ISF Congress
SEPTEMBER 27–30, 2009
SYDNEY, AUSTRALIA
www.isfsydney2009.com

5th Congress of the Portuguese Proteomics Network and 1st International Congress on Analytic Proteomics
SEPTEMBER 30–OCTOBER 3, 2009
CAPARICA, PORTUGAL
www.cqfb.fct.unl.pt

6th International Congress on Heme Oxygenases in Biology and Medicine
SEPTEMBER 30–OCTOBER 4, 2009
MIAMI BEACH, FL
www.hemeoxygenases.org

OCTOBER 2009

3rd ESF Functional Genomics Conference
OCTOBER 1–4, 2009
INNSBRUCK, AUSTRIA
www.esffg2008.org

3rd Central and Eastern European Proteomics Conference
OCTOBER 6–9, 2009
BUDAPEST, HUNGARY
www.chemres.hu

SACNAS National Conference: Improving the Human Condition: Challenges for Interdisciplinary Science
OCTOBER 15–18, 2009
DALLAS, TX
www.sacnas.org/confnew/confclient

7th Euro Fed Lipid Congress
OCTOBER 18–21, 2009
GRAZ, AUSTRIA
www.eurofedlipid.org/meetings/graz/

Systems Biology for Biochemists
OCTOBER 22–25, 2009
TAHOE CITY, CA
Organizer: Arcady Mushegian, Stowers Institute for Medical Research
www.asbmb.org/meetings

Bioactive Lipids in Cancer, Inflammation, and Related Diseases (11th International Conference)
OCTOBER 25–28, 2009
CANCUN, MEXICO
www.bioactivelipidsconf.wayne.edu

2009 Swiss Group for Mass Spectrometry Meeting
OCTOBER 28–29, 2009
BEATENBERG, SWITZERLAND
www.sgms.ch

NOVEMBER 2009

Annual Biomedical Research Conference for Minority Students
NOVEMBER 4–7, 2009
PHOENIX, AZ
www.abrcms.org/index.html

Mass Spec Europe
NOVEMBER 5–6, 2009
BARCELONA, SPAIN
www.selectbiosciences.com

7th Annual World Congress on the Insulin Resistance Syndrome
NOVEMBER 5–7, 2009
SAN FRANCISCO, CA
www.insulinresistance.us

Annual Meeting of the Society for Glycobiology
NOVEMBER 12–15, 2009
SAN DIEGO, CA
www.glycobiology.org

American Heart Association Scientific Sessions 2009
NOVEMBER 14–18, 2009
ORLANDO, FL
www.scientificsessions.org

4th Barossa Meeting: Cell Signaling in Cancer and Development
NOVEMBER 18–21, 2009
BAROSSA VALLEY, SOUTH AUSTRALIA
sapmea.asn.au/conventions/signalling09/index.html

20th International Symposium on Glycoconjugates
NOVEMBER 29–DECEMBER 4, 2009
SAN JUAN, PR
www.glyco20.org

DECEMBER 2009

49th Annual Meeting of the American Society for Cell Biology
DECEMBER 5–9, 2009
SAN DIEGO, CA
www.ascb.org/meetings

JANUARY 2010

Keystone Symposium—Adipose Tissue Biology
JANUARY 24–29, 2010
KEYSTONE, CO
www.keystonesymposia.org

FEBRUARY 2010

AAAS Annual Meeting
FEBRUARY 18–22, 2010
SAN DIEGO, CA
www.aaas.org/meetings

Biophysical Society 53rd Annual Meeting
FEBRUARY 28–MARCH 4, 2009
BOSTON, MA
www.biophysics.org/Default.aspx?alias=www.biophysics.org/2009meeting

APRIL 2010

Keystone Symposium—Diabetes
APRIL 12–17, 2010
WHISTLER, CANADA

ASBMB Annual Meeting
APRIL 24–28, 2010
ANAHEIM, CA
www.asbmb.org/meetings.aspx

MAY 2010

6th International Atherosclerosis Society Workshop on High Density Lipoproteins
MAY 17–21, 2010
WHISTLER, CANADA
www.athero.org

JUNE 2010

8th International Conference on Hyaluronan of the International Society for Hyaluronan Sciences
JUNE 6–11, 2010
KYOTO, JAPAN
www.ISHAS.org

Keystone Symposium—Bioactive Lipids: Biochemistry and Diseases
JUNE 6–11, 2010
KYOTO, JAPAN
www.keystonesymposia.org

11th International Symposium on the Genetics of Industrial Microorganisms
JUNE 28–JULY 1, 2010
MELBOURNE, AUSTRALIA
www.gim2010.org

AUGUST 2010

9th International Mycological Congress (IMC9): The Biology of Fungi
AUGUST 1–6, 2010
EDINBURGH, UNITED KINGDOM
www.imc9.info

14th International Congress of Immunology
AUGUST 22–27, 2010
KOBE, JAPAN
www.ici2010.org

APRIL 2011

ASBMB Annual Meeting
APRIL 9–13, 2011
WASHINGTON, D.C.
www.asbmb.org/meetings.aspx

Announcing the Thermo Scientific RNAi Discovery Grant Program.

Thermo Scientific RNAi Discovery Grant Program is awarding over $400,000 in RNAi-based screening resources to Life Science researchers. Awards include combinations of industry-leading whole genome siRNA, shRNA and microRNA reagents from Thermo Scientific Dharmacon and Open Biosystems RNAi technologies.

- Significant awards will be made to several talented life scientists to help advance scientific discovery and medicine.
- Whole genome screening award also includes membership into the RNAi Global Initiative (RGI) screening community

We invite the life science community to submit applications describing projects using RNAi-based screening.

Visit **www.thermo.com/RNAiDiscovery** to apply and view all award rules and restrictions.

Apply online by September 7.

Simple application process.
Submit a simple online application. Award recipients will be selected based on scientific merit and impact.

Moving science forward

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