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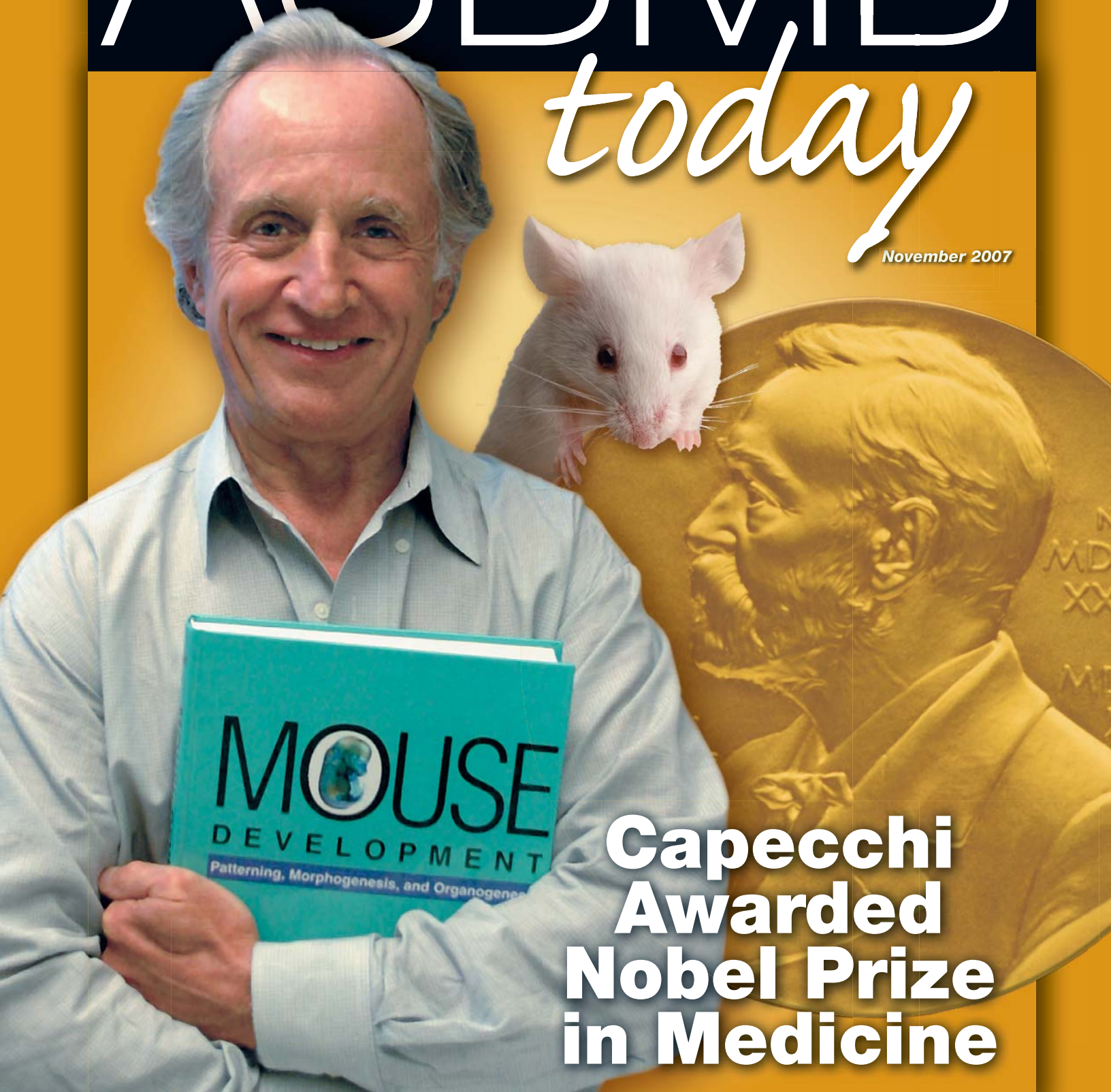
ASBMB today

November 2007



Capecchi Awarded Nobel Prize in Medicine

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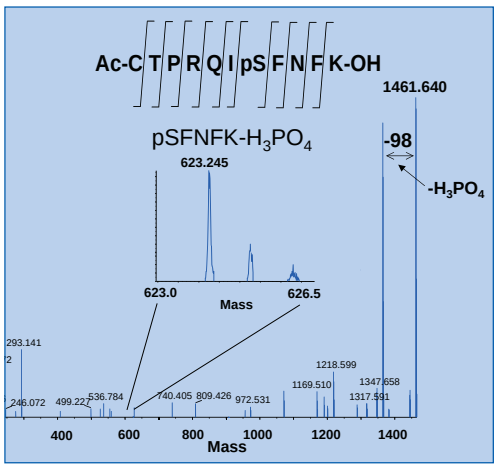

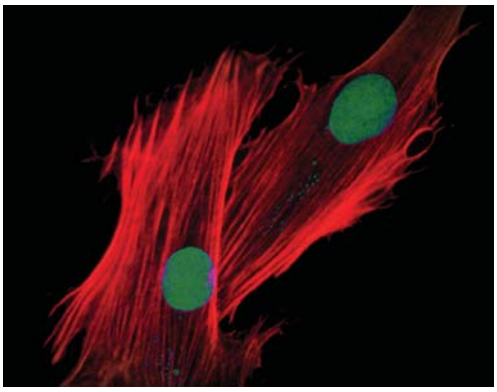

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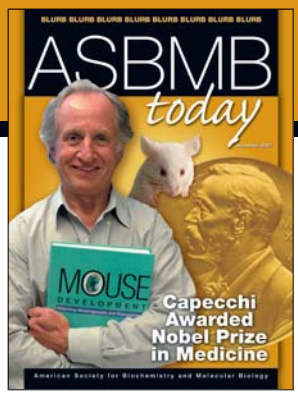

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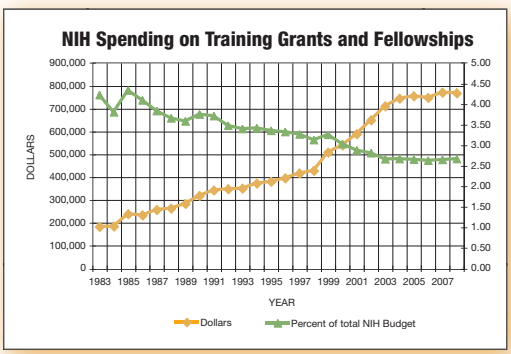

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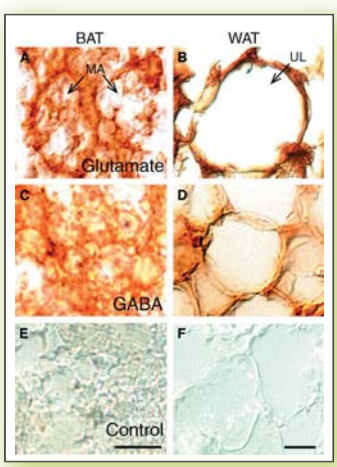

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ASBMB today

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president's message

Great Session Planned for Grad Students and Postdocs at Annual Meeting

BY HEIDI HAMM

While public policy is obviously a major interest of mine (as those of you who read my columns here know) I am also an educator and a researcher. Thus, I'm happy to write this month about another subject dear to my heart—graduate and postdoctoral professional development and the exciting program the Society has created for the annual meeting in San Diego next April.

The Graduate and Postdoctoral Professional Development Program has been put together by:

- Kimberly Dodge-Kafka, University of Connecticut Health Center in Farmington,
- John M. Denu, University of Wisconsin Medical School,
- Ann L. Miller, University of Wisconsin–Madison,
- Jerome C. Nwachukwu, Sackler Institute of Graduate Biomedical Studies, New York University School of Medicine, and
- Miti Shah, Arizona State University.

"We wanted to reach out to younger members," says Dodge-Kafka, "to provide them some advice on training and career options and to make them feel more included in Society affairs."

The day-long event kicks off on Saturday, April 5, 2008, with a panel and discussion session on career options, featuring speakers from the areas of patent law, science writing, industry consulting, and more.

A group networking lunch will be followed by short oral talks presented by select Graduate Minority and Graduate/Postdoctoral Travel Award recipients.

Afternoon workshops will highlight topics including: Lab Productivity/Lab Management, Matching Yourself with a Mentor, Pinpointing the Perfect Postdoc, and Making the Most of Your Postdoc Experience. Following these career development workshops, program attendees will join the main meeting at The Herbert Tabor/*Journal of Biological Chemistry* Lectureship, featuring I. Robert Lehman of Stanford University.

Space is limited, and registration is accepted when registering for Experimental Biology (EB) 2008. The cost is $20 for ASBMB members and $25 for all other EB registrants.

Please note that if you are a Graduate Minority or Graduate/Postdoctoral Travel Award recipient, registration for the program is included as part of your travel award.

We hope all postdocs and graduate students will plan to attend. And please, all you "seasoned" investigators, make sure to encourage your students to attend.

FASEB Comments on Biosecurity Oversight Proposal

BY CARRIE D. WOLINETZ

Earlier this year, the National Science Advisory Board on Biosecurity (NSABB), the federal advisory group tasked with developing guidelines for dual use biological research (i.e. research that can be used for positive benefit or misused to cause harm), released a draft report on a proposed oversight framework for dual use research. The document details guidance for the identification, review, and communication of what NSABB terms dual use research of concern, or DURC. The major points of the proposal include:

- Recommendations for mandatory training for all scientists, trainees, and staff about dual use research;
- All principal investigators would review their research program to see if it matches the criteria for DURC based on a questionnaire developed by NSABB; if not, they would check a box on grant applications to that effect and agree to yearly review;
- Research identified as DURC would trigger an institutional, risk assessment-based review, perhaps through the existing Institutional Biosafety Committees (IBCs) and development of subsequent risk management and communications plans (NSABB also provides tools and guidance for development of such plans);
- Recommendation for mandatory compliance with dual use oversight guidance and penalties for non-compliance;
- Recommendations that scientific societies develop codes of conduct for dual use research and provide guidance and sample language for codes;
- A latitude for interpretation deliberately, so that federal agencies can make their own detailed regulations.

Although NSABB does not have the authority to issue official regulations, the reality is such that government guidelines are often given the force of regulation in their implementation by the federal agencies. In addition, the agencies that serve as ex-officio members of NSABB could initiate a regulatory rulemaking process based on NSABB's proposal.

FASEB submitted a lengthy analysis and comment letter to NSABB in response to the board's request for input from the scientific community. Chief among our concerns is the ambiguity and subjectivity inherent in identifying dual use research of concern. Although the NSABB proposal is modeled after other regulatory schema, such as Institutional Animal Care and Use Committees (IACICs), IBCs, and Institutional Review Boards (IRBs), the difficulty in identifying what is to be overseen is unique. One is either using animals, recombinant DNA, or human subjects and is therefore subject to review, or one is not. This is in contrast to dual use research, in which the need for review is subject to a great deal of interpretation. NSABB itself found that there were "significant differences in assessments made by individual NSABB members" and that there were "difficulties inherent in explicitly defining the point at which the magnitude and/or immediacy of the threat of misuse makes dual use research 'of concern.'"

Because of the difficulties in identifying research to be reviewed, FASEB also expressed concerns related to the feasibility and potential burden of the system. In particular, the vagueness of the criteria could lead to vast underreporting by investigators or overreporting by institutions concerned about liability. Either scenario diminishes the goal of increasing security. Also of security concern are the products that could potentially be produced during the review process. The scientific and security communities have struggled, in a number of venues, with the concept of "sensitive but unclassified" information. The proceedings of dual use review meetings, the documents provided by NSABB as tools for review, or the documenting of decisions that identify research that may merit discontinuation or restrictions on publication: whose responsibility is it to ensure their security? Many questions are raised by a process that highlights research of security concern and then attempts to retroactively control information related to it.

The entire FASEB letter and analysis may be read at: opa.faseb.org/pdf/NSABB.Final.8.8.07.pdf, and the NSABB proposal may be found on their Web site: www.biosecurityboard.gov. It remains to be seen what the next steps for NSABB or the federal government are in regard to modifying or moving forward with this proposal, but in the meantime NSABB has been focusing on working with the international community in an effort to inform and coordinate with other nations on dual use biosecurity issues.

Carrie D. Wolinetz is with the FASEB Office of Public Affairs.

NIH, NSF Funding Bills Begin to Move

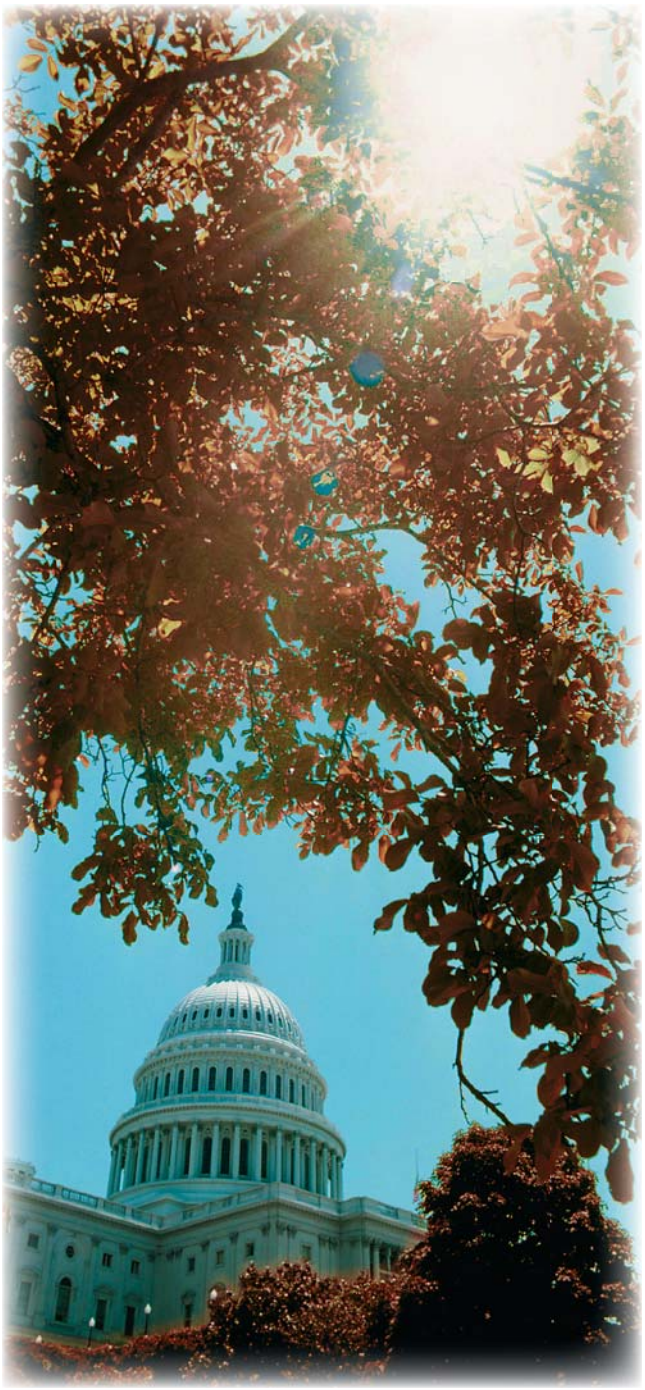
BY PETER FARNHAM

On October 3, Senator Tom Harkin's (D-IA) staff convened a meeting of representatives of various health, education, and labor groups (including ASBMB and FASEB staff) to discuss the status of the 2008 Labor/Health & Human Services (HHS) Appropriations bill. He asked for grassroots support of all interested parties, including advocacy groups for biomedical research. Since the National Institutes of Health (NIH) is funded under this bill, the bill is obviously of considerable concern to ASBMB.

The Senate version of the bill allocates $29.9 billion to NIH for fiscal year (FY) 2008, $800 million (2.8%) over FY 2007. ASBMB has up to now supported a $1.9 billion increase (6.7%) for three years, intended to recover the agency's purchasing power lost since the doubling of the agency's budget was completed in FY 2003.

The Senate's proposed increase is less than half what ASBMB has supported and does not keep pace with biomedical inflation. Nevertheless, it is $1.2 billion over the President's request for FY 2008, and the overall bill exceeds his budget request by $12 billion. These facts have already prompted a veto threat from the White House. Harkin and Senator Arlen Specter (R-PA) are requesting the mobilization of grassroots groups to urge all senators to support the measure and then, assuming it passes and is conferenced with the House, to pressure the White House not to veto the bill.

The bill is expected to undergo a quick conference due to the similarity between the House and Senate versions, and it is hoped that the bill will pass the Senate the week of October 16, following the Senate's Columbus Day recess, and then go to the President in early November. Staff has begun pre-conferencing, and Harkin has been in touch with House Appropriations Chair David Obey (D-WI). Harkin urged the community to refrain from supporting amendments that would rearrange funding, including amendments to offset spending increases for certain programs with across the board cuts of the bill.



He also solicited ideas for increasing publicity on the bill, particularly as the expected Presidential veto will come on the heels of the October 3 veto of the State Children's Health Initiative Program (SCHIP). It is hoped that increased visibility and pressure may dissuade the White House from a veto "showdown." It is not yet clear whether the measure will garner enough support to override a veto. The current read on this is that the votes are there for an override in the Senate but not in the House.

President Bush has threatened to veto 9 of the 12 regular appropriations bills in their current form because together they exceed by $22 billion his avowed spending limit of $933 billion in discretionary spending for 2008.

The battle over the additional spending Congress wants comes against the backdrop of an administration request for an additional $42 billion in supplemental spending for the war in Iraq and Afghanistan. FASEB Legislative Affairs Director Jon Retzlaff notes that the current spending battle between Congress and the White House makes the government as divided as it's been since the federal shutdown of 1995. "The President has drawn a line in the sand at limiting total spending to $933 billion in FY 2008," Retzlaff noted, "and is receiving support from House Republicans, who have been arguing all year that they lost Congress by not staying true to their principles, particularly on controlling spending. Democrats are adamant that many programs besides those related to defense, homeland security, veterans, and foreign operations deserve to be supported. Therefore, it's extremely likely that we will be discussing the FY 2008 appropriations process well into December." FY 2008 of course began on October 1.

Continuing Resolution

All programs funded under appropriations bills are currently operating under a continuing resolution (CR) through November 16. Chairman Harkin predicted there would be a second CR, perhaps lasting until December 21, with daily funding extensions possible if needed.

The House has passed all 12 appropriations bills, but the Senate has approved only 4. Under the CR, federal government agencies and programs, including NIH, the National Science Foundation (NSF), the Department of Energy's (DOE's) Office of Science, the Department of Agriculture's National Research Initiative, and the National Aeronautics and Space Administration (NASA), will be funded at the same level as in 2007.

The Senate's proposed increase is less than half what ASBMB has supported and does not keep pace with biomedical inflation.

NSF Gets Good Increase, but Veto Looms Here, Too

Congress and the President are in agreement that the National Science Foundation's budget should be increased. The President proposed a $500 million increase at NSF for FY 2008 to $6.4 billion. The House bill proposes to increase NSF spending by $600 million, and the Senate bill proposes a $700 million increase. Unfortunately, the President has threatened to veto this appropriations bill as well because of proposed Congressional spending above the President's request and also because of report language regarding NSF found in the House version.

Congress and the President are in agreement that the National Science Foundation's budget should be increased.

Most of the proposed increase at NSF under the House and White House proposals would be concentrated in support of several disciplines—math, physics, chemistry, computer sciences, and engineering. ASBMB supports these increases but has also called for comparable increases in the biological sciences directorate, which would receive less than half of the increases proposed for the other disciplines listed above. ASBMB is thus supporting a letter to the Senate calling for a redress of the disparity between the spending levels in the various directorates.

The letter takes note of report language in the House bill that makes this point:

> "The Committee strongly supports increases for the math and physical sciences, computer sciences, and engineering directorates in fiscal year 2008 for research and related activities (R&RA). However, the Committee also believes the Foundation should maintain comparable growth in fiscal year 2008 for the biological sciences, geosciences, and social, behavioral and economic sciences directorates. As the Innovation Agenda moves forward, it is important to note that maintaining U.S. competitiveness will depend on advances in, and the interactions among, all fields of science. The Committee expects NSF to ensure that the biological sciences, geosciences, and social, behavioral, and economic sciences directorates receive increases in fiscal year 2008 that are comparable to the other directorates."

The letter urges Senators to support inclusion of this language in the conference report.

asbmb member spotlight

Malamud Awarded $6.25 Million NIH Grant

Daniel Malamud, a professor of basic science and craniofacial biology at the New York University College of Dentistry (NYUCD), has been awarded a five year, $6,258,768 grant from the National Institute of Dental and Craniofacial Research (NIDCR) of the National Institutes of Health (NIH) to head up a research collective consisting of four interrelated research projects along with administrative/biostatistical and clinical core components.

The collective's overall goal is to define the interactions between host defense molecules and bacteria in HIV infection and subsequent antiretroviral therapy. The collective consists of teams from NYUCD, New York University School of Medicine, and the Aaron Diamond AIDS Research Center.

"The study is an intriguing one," notes Malamud. "We are going to recruit a population of people that are HIV-infected but are drug naïve, so they haven't even been put on treatment yet. New York City is probably one of the few places in the country where the study could be done."

The entire proposal utilizes the same case-controlled study population consisting of 85 HIV positive, therapy-naïve subjects whose illness is highly aggressive who will subsequently begin antiretroviral therapy. There will also be a similar cohort of HIV-negative subjects.

Fields Earns Vollum Award

Stanley Fields, a Howard Hughes Medical Institute (HHMI) Investigator at the University of Washington School of Medicine, has received the 2007 Vollum Award for Distinguished Accomplishment in Science and Technology from Reed College.

The award was created and first presented by Reed College in 1975. It recognizes and celebrates the exceptional achievement of one or more members of the scientific and technical community of the Northwest. The name of the award is a tribute to the late Howard Vollum, one of the nation's great innovators and technologists and a Reed physics alumnus.

"Like the traits prized for the Vollum Award, creativity, risk taking, exploration of unproven avenues, and an embrace of the unknown mark HHMI appointees, Fields' research career is emblematic of these traits and of his unquenchable curiosity," said Janis Shampay, a professor of biology at Reed.

Fields developed the yeast two-hybrid system, which detects interactions between two different proteins in living cells. He and his colleagues also published the first analysis of all possible yeast protein interactions, which involves 6,000 proteins.

FIELDS PHOTO: PAUL FETTERS

Gilbert to Become Head of Biology at Rensselaer Polytechnic Institute

Susan P. Gilbert, an expert in cell biology, biophysics, and nanoscience, joined Rensselaer Polytechnic Institute as the head of the Biology Department this past September. Gilbert joins the Rensselaer faculty after 12 years at the University of Pittsburgh.

Gilbert plans to build on the key strengths of the Biology Department. "With the hiring of top-level constellation chairs and faculty, the Biology Department has an extremely strong foundation," she said. "I hope to build on this foundation by utilizing Rensselaer's strong interdisciplinary approach to research and learning. In this environment, we can rapidly incorporate new approaches for undergraduate and graduate education."

Gilbert has spent more than 20 years in higher education. At the University of Pittsburgh she served on the faculty of the Department of Biological Sciences. During her time there she was a member of the Molecular Biophysics and Structural Biology Graduate Program and the University of Pittsburgh Cancer Institute.

Gilbert is known for her research on cell motility. She studies the interaction of kinesins with microtubules, working to understand the kinesins that function in cell division.

Benos Named Distinguished Faculty Lecturer

Dale J. Benos, chair of the Department of Physiology and Biophysics at the University of Alabama at Birmingham (UAB), is the recipient of the university's 2007 Distinguished Faculty Lecturer Award—the UAB Academic Health Center's most prestigious faculty award. Benos received the award and presented a lecture at a banquet held in his honor in October.

The award acknowledged Benos' many achievements and the high regard in which he is held by his peers. It was also a reflection of his contributions to the university and the community.

Benos' research centers on ion channels and membrane-transport processes. He focuses on a number of disease states and the involvement of proteins in diseases such as hypertension and cystic fibrosis. His laboratory also is investigating the role of ion channels and transporters in human brain tumors.

Benos has chaired the Department of Physiology and Biophysics since 1996 and holds secondary appointments in the Departments of Cell Biology, Neurobiology, and Physiological Optics. In addition, he is a senior scientist in eight research centers. He is also an associate editor for the *Journal of Biological Chemistry*.

Spector Receives Leaf Distinguished Scientist Award

Arthur Spector, the University of Iowa Foundation Distinguished Professor of Biochemistry and Internal Medicine in the Roy J. and Lucille A. Carver College of Medicine, has been named the recipient of the Alexander Leaf Distinguished Scientist Award from the International Society for the Study of Fatty Acids and Lipids (ISSFAL).

The award was established by the society in 2002 to honor the work of Alexander Leaf and his support for ISSFAL and to recognize and reward excellence in areas of research relevant to ISSFAL core interests.

Spector will deliver the featured lecture during the opening ceremonies of the ISSFAL's eighth international meeting in May 2008.

Spector's research focuses on fatty acids in biological systems. In particular, he is interested in the role of polyunsaturated fatty acids in vascular disease and how they affect the function of brain cells.

Spector served as the president of ISSFAL from 2000 to 2003. He is a member of the advisory board for the journal *Progress in Lipid Research and Prostaglandins and Other Lipid Mediators*. He is on the editorial board of the *Journal of Lipid Research* and chairs the scientific advisory board for Wake Forest and Brigham and Women's Botanical Lipids Center.

Maccarrone Honored with IACM Award

Mauro Maccarrone, professor of biochemistry and chairman of biotechnology at the University of Teramo (Italy) and chief of the Laboratory of Lipid Neurochemistry of the European Center for Brain Research-S. Lucia Foundation (Rome, Italy), has received the 2007 Award for Basic Research from the International Association for Cannabis as Medicine (IACM).

The IACM award consists of a cash prize and a plaque, and the award is presented every second year to recognize "the special achievements of a candidate who has made a major contribution to the re-introduction of cannabis and cannabinoids as medicine through basic research." Maccarrone was honored in October at the 4th IACM biennial conference during a gala dinner in Cologne, Germany.

Maccarrone's studies have revealed molecular details of the dysregulation of the endocannabinoid system that underlie human pathologies like spontaneous miscarriage, headache, Parkinson disease, Huntington disease, and multiple sclerosis. His work has contributed to the identification of novel regulatory pathways that have led to new diagnostic tools and therapeutic strategies for the treatment of those diseases, based on endocannabinoid-oriented drugs.

Boutaud Receives Gilbert Foundation/AFAR New Investigator Award

Olivier Boutaud, assistant professor at Vanderbilt University Medical Center, was one of six early-career scientists who were awarded the first Rosalinde and Arthur Gilbert Foundation/American Federation for Aging Research (AFAR) New Investigator Award in Alzheimer disease.

The $60,000 award provides funding for a broad array of research that investigates the causes and progression of Alzheimer disease, including the basic mechanisms of aging, genetics, biomarkers, inflammation, and the impact of exercise and the environment.

Boutaud's proposal was titled "Quantification of the relative abundance of secreted Amyloid precursor protein (APP) alpha and beta as a biomarker of Alzheimer's disease." He will determine whether levels of secreted APP α and β could serve as an effective biomarker for Alzheimer disease. This biomarker could potentially be used as a prognostic tool to track the progression of the disease as well as monitor the biological effects of new therapeutic agents.

"The Rosalinde and Arthur Gilbert Foundation has invested in an outstanding group of researchers who have the potential to make important and lasting contributions to Alzheimer disease and aging science," said Martin H. Blank, Jr., co-director of the Rosalinde and Arthur Gilbert Foundation.

IN MEMORIAM

Rosalind Kornfeld 1935–2007

Rosalind Hauk Kornfeld passed away on August 10, 2007. She was born in 1935 in Dallas, Texas, and graduated from George Washington University in 1957 with a B.S. in chemistry. Kornfeld then earned a doctorate in biochemistry from Washington University in St. Louis in 1961. She subsequently stayed on as a postdoctoral fellow until 1963 when she joined the National Institutes of Health as a fellow. In 1965, Kornfeld joined the faculty of Washington University School of Medicine where she spent the rest of her academic career. In 1969, she was promoted to research assistant professor; in 1971, research associate professor; in 1978, associate professor; and in 1981, full professor of medicine and professor of biochemistry and molecular biophysics.

For almost 40 years, Kornfeld's research focused on the structure and biosynthesis of oligosaccharide chains on glycoproteins. She was among the first to discover the structure of many oligosaccharides and to characterize how they were formed.

Mario R. Capecchi Receives Nobel Prize in Physiology or Medicine

ASBMB member Mario R. Capecchi, a distinguished professor of human genetics and biology at the University of Utah's Eccles Institute of Human Genetics and a Howard Hughes Medical Institute investigator, was awarded one-third of this year's Nobel Prize in Physiology or Medicine. He shared the prize with Sir Martin J. Evans of Cardiff University in the United Kingdom and Oliver Smithies of the University of North Carolina at Chapel Hill "for their discoveries of principles for introducing specific gene modifications in mice by the use of embryonic stem cells." The prize recognizes Capecchi's pioneering work in gene targeting in mice, a technique that has revolutionized mammalian biology and allowed the creation of animal models for hundreds of human diseases.

"…for discoveries of principles for introducing specific g

In the 1980s, both Capecchi and Smithies were seeking ways to specifically alter the mammalian genome. Capecchi wanted to insert new genes into cells, and Smithies was hoping to correct genetic defects that lead to disease. Capecchi was able to demonstrate that homologous recombination could take place between introduced DNA and the chromosomes in mammalian cells and was thus able to repair defective genes. Smithies showed that that endogenous genes could be targeted irrespective of their activity, suggesting that all genes were accessible to modification by homologous recombination. Thus, the two scientists independently discovered that they could use homologous recombination to introduce short sequences of manipulated DNA into the chromosomes of mammalian cells.

However, the cell lines initially studied by Capecchi and Smithies could not be used to create gene-targeted animals. Fortunately, Evans had developed embryonic stem cell cultures that were able to take the genetic manipulations from the Petri dish into the whole animal. Combining the techniques by modifying genes in embryonic stem cells and then injecting those cells into fertilized mouse eggs, the scientists were able to produce mice with specific genetic modifications that could be inherited between generations.

Capecchi was born in Verona, Italy, in 1937. At the age of four, he was separated from his mother, who was imprisoned during World War II. For the next four and a half years he lived on the streets, fending for himself by begging and stealing. He reunited with his mother when he was nine, and they soon came to the United States where Capecchi began elementary school. As a result, he didn't learn to read or write until he was nine years old.

"I think [this experience] provided resourcefulness, and I think just the drive to keep yourself, maintain yourself, and survive," said Capecchi. "I think it led me to be able to use my own resources, to be able to get through life. And I think now I'm also very grateful; in a sense it's fantastic. I mean most children didn't make it; I think I was extremely lucky."

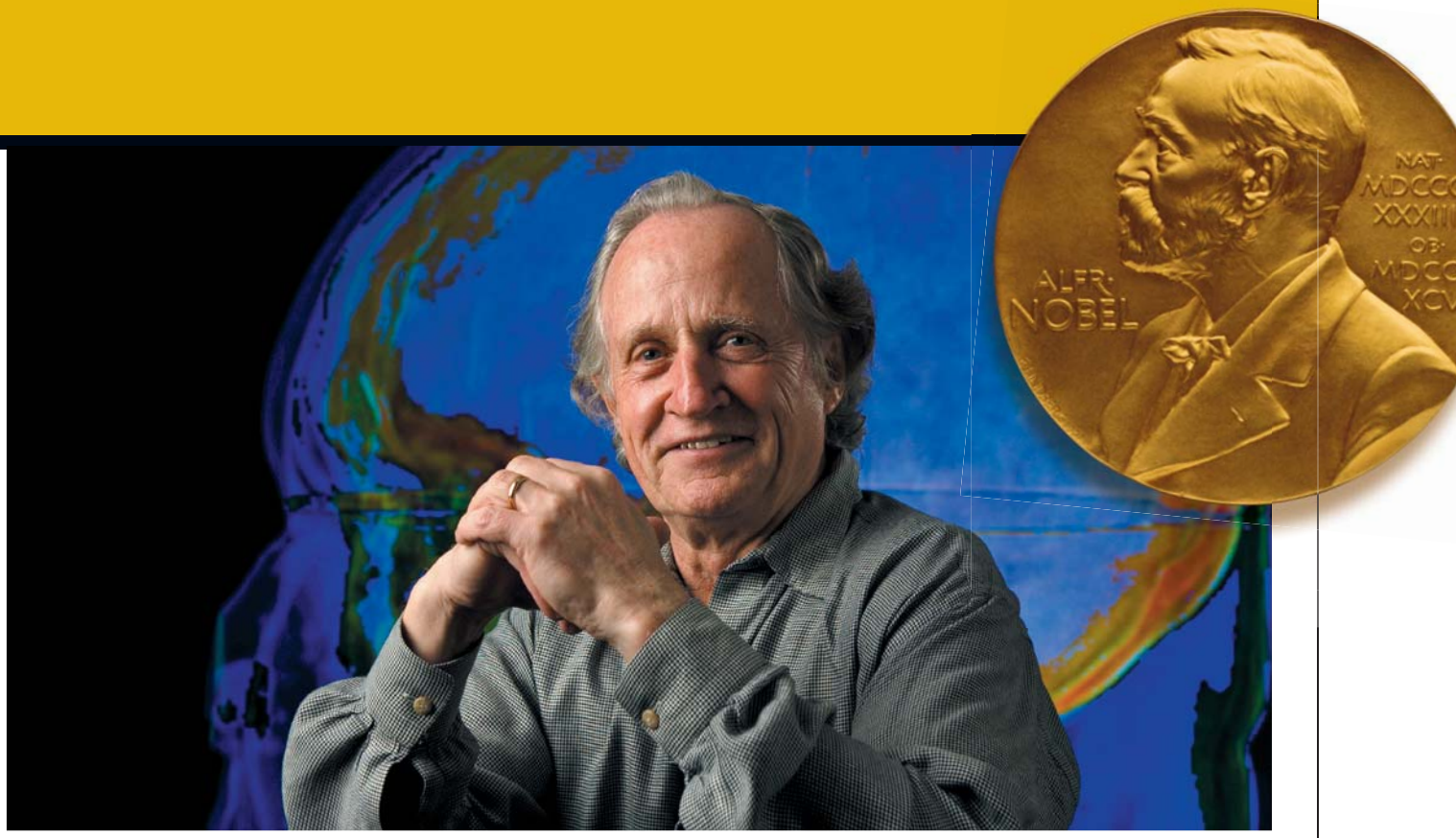
Capecchi received his B.S. in chemistry and physics from Antioch College in 1961 and his Ph.D. in biophysics from Harvard University in 1967. He completed his thesis work under the guidance of Nobel laureate James D. Watson, whom he credits for inspiring his development as a scientist.

"He taught me not so much about how to do science but rather provided me with the confidence to tackle any scientific question that fascinated me, regardless of its complexity," said Capecchi. "He also taught me the importance of communicating your science clearly and to pursue important scientific questions."

After receiving his Ph.D., Capecchi joined the faculty of the Department of Biochemistry at Harvard Medical School. He stayed there for four years, and then, in 1973, he left to join the University of Utah faculty.

His entry into what was going to become the field of gene targeting started in 1977 when he was experimenting with the use of extremely small glass needles to inject DNA directly into the nuclei of living cells. He attempted to introduce a functional gene into cells by injecting the DNA directly into their nuclei, and he succeeded. Because the procedure turned out to be extremely efficient—one in three cells received the DNA in functional form and went on to divide and pass the gene on to its daughter cells—it became practical to use this technology to generate transgenic mice by the injection of DNA into one-cell zygotes.

Capecchi recalls, "I realized immediately that, if I could



c gene modifications in mice by the use of embryonic stem cells."

harness this machinery to carry out homologous recombination between a newly introduced DNA molecule of our choice and the same DNA sequence in the cell's chromosome, I would have the ability to mutate at will any specific gene in the living cell."

However, in 1980, when he submitted a grant application to the National Institutes of Health in which he outlined the experiments he intended to do to test the feasibility of gene targeting in mammalian cells, the grant was rejected.

"Our first grant was actually refused with respect to that project, mainly because they didn't think it was possible," said Capecchi. "The probability that an exogenous piece of DNA would be able to find the cognate sequence in 33 base pairs was thought to be not a significant possibility."

Despite this rejection, he forged ahead with his experiments and succeeded. The next step was to extend gene targeting to a whole animal. "Because of the low frequency of targeting events in mammalian cells, it was clear that doing the experiments directly in mouse zygotes would not be practical," recalls Capecchi. "Rather, targeting events had to be identified first in cultured cells to allow purification of a clonal cell line containing the desired gene disruption; these cells in turn could be used to generate mice capable of transmitting the mutation in their germline."

Capecchi heard about Evans' embryonic stem cells at a Gordon Conference in 1984, and a collaboration was initiated. For the initial experiments Capecchi decided to disrupt the hprt gene, and he showed that embryonic stem cells were indeed able to mediate homologous recombination. The first reports in which homologous recombination in embryonic stem cells was used to generate gene-targeted mice were published in 1989. Since then, the number of reported knock-out mouse strains has risen exponentially. Gene targeting has since developed into a highly versatile technology. It is now possible to introduce mutations that can be activated at specific time points or in specific cells or organs, both during development and in the adult animal.

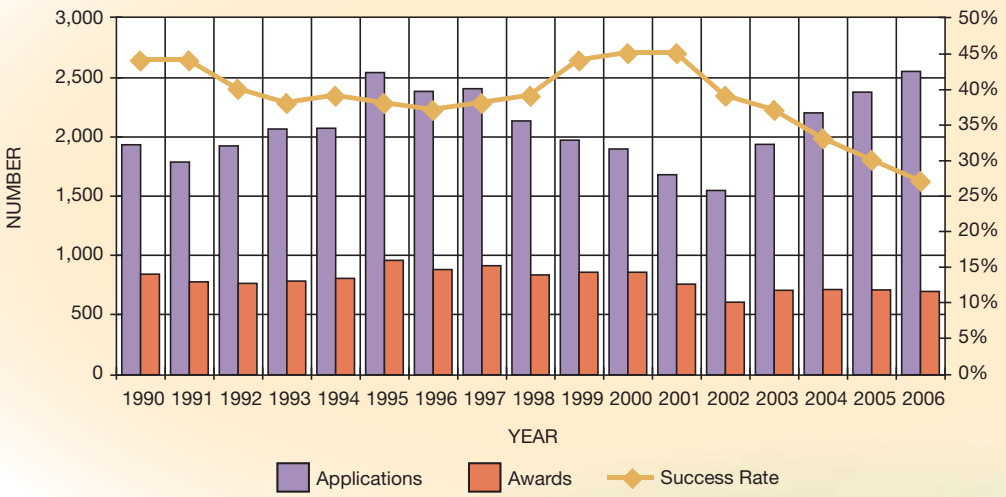
Over the years, Capecchi has used gene targeting to systematically knock out genes in the Hox family. These are thought to be the master switches that control the formation of the body plan during development. The knock-out mice have dramatic developmental defects. For example, when Capecchi completely disrupted the Hox10 and Hox11 gene families, he found that the genes played important roles in orchestrating the construction of the ribs, spine, and limb bones. Mice without a functional Hoxb8 gene on the other hand, groomed themselves excessively, creating bald spots and skin wounds.

Capecchi and his colleagues have also developed the first accurate mouse model of alveolar rhabdomyosarcoma, an aggressive childhood muscle cancer. This new model has improved researchers' understanding of the cause of the disease and may lead to new therapies to treat the disorder.

Trends in Postdoctoral Training

The following graphs are part two of a series of data compiled by Howard Garrison and Kimberly McGuire of FASEB's Office of Public Affairs. The graphs represent trends in postdoctoral training. The final installment of graphs will appear in the next issue of *ASBMB Today*.

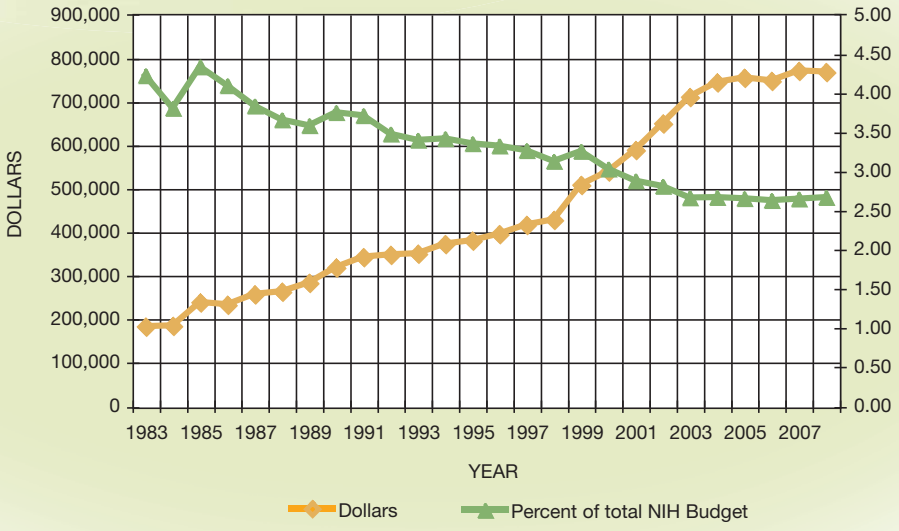
NIH F32 Fellowship Applications Reviewed and Awarded



Although the number of applications for NIH National Research Service Awards (Postdoctoral F32 Fellowships) has increased since 1990, the number of awards given has decreased, leading to an overall decline in success rate over the years.

SOURCE: THE NATIONAL INSTITUTES OF HEALTH (GRANTS1.NIH.GOV/GRANTS/AWARD/AWARD.HTM).

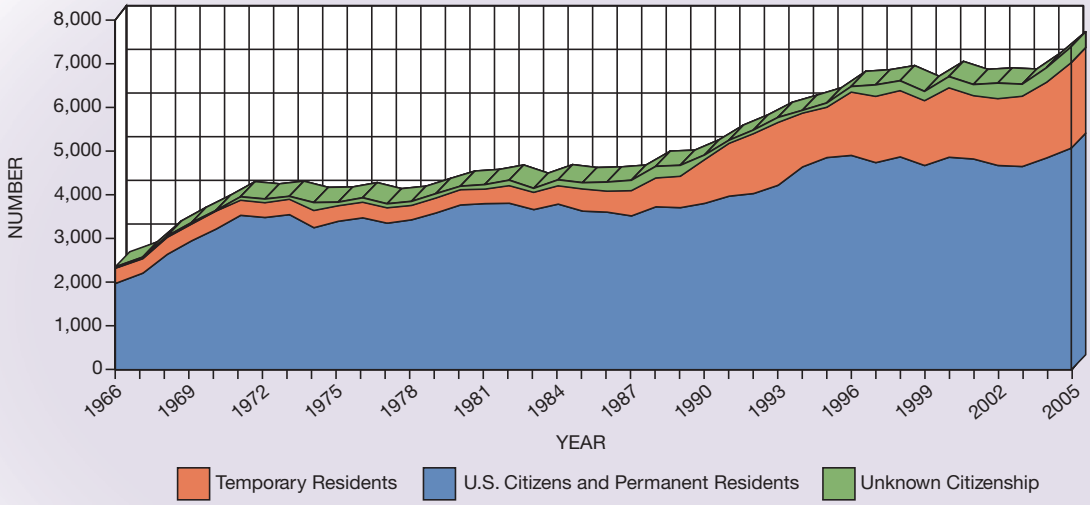
NIH Spending on Training Grants and Fellowships



Since 1983, total NIH spending on training grants and fellowships for postdoctoral fellows has increased. However the dollar amount as a percentage of the total NIH budget has decreased from 4.2 to 2.7%.

SOURCE: NATIONAL INSTITUTE OF HEALTH SUMMARY OF THE FY 2008 PRESIDENT'S BUDGET (OFFICEOFBUDGET.OD.NIH.GOV/UI/HISTORICALBUDGETREQUESTS.HTM).

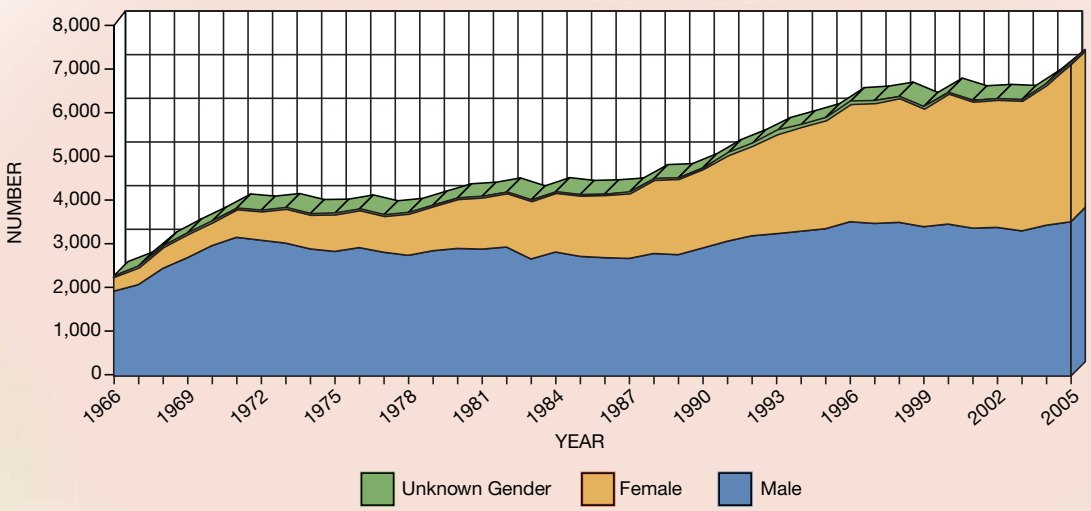
Doctorate Degrees Awarded in the Biological and Medical Sciences by Citizenship/Visa Status



The number of doctorate degrees awarded in the biological and medical sciences has increased steadily, and a larger number of these degrees have been awarded to temporary residents of the United States.

SOURCE: THE NATIONAL SCIENCE FOUNDATION SURVEY OF EARNED DOCTORATES (WWW.NSF.GOV/STATISTICS/DOCTORATES/).

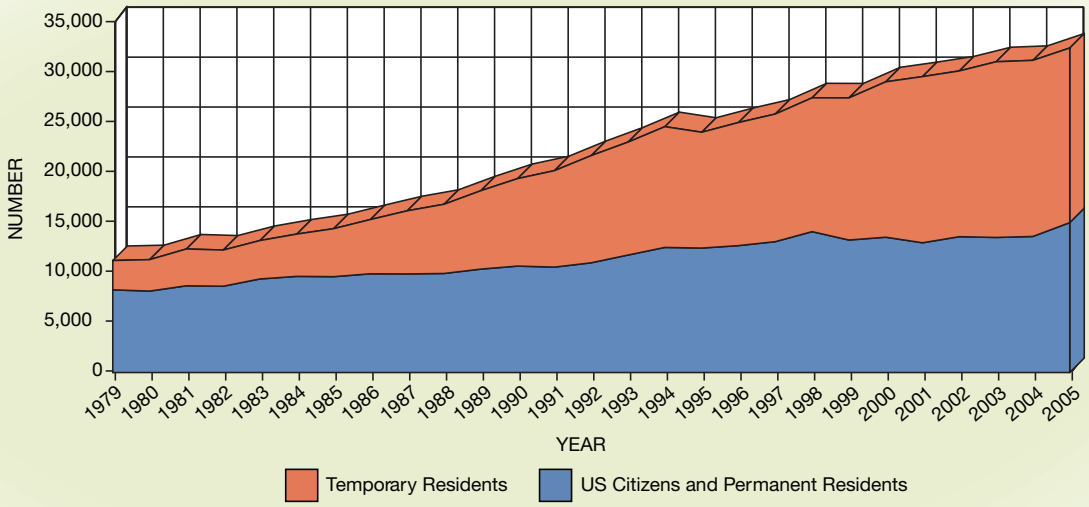
Doctorate Degress Awarded in the Biological and Medical Sciences by Gender



While the number of men receiving doctorate degrees has approximately doubled since 1966, the number of women has increased 10-fold. In 2005, more women than men received doctorate degrees.

SOURCE: THE NATIONAL SCIENCE FOUNDATION SURVEY OF EARNED DOCTORATES (WWW.NSF.GOV/STATISTICS/DOCTORATES/).

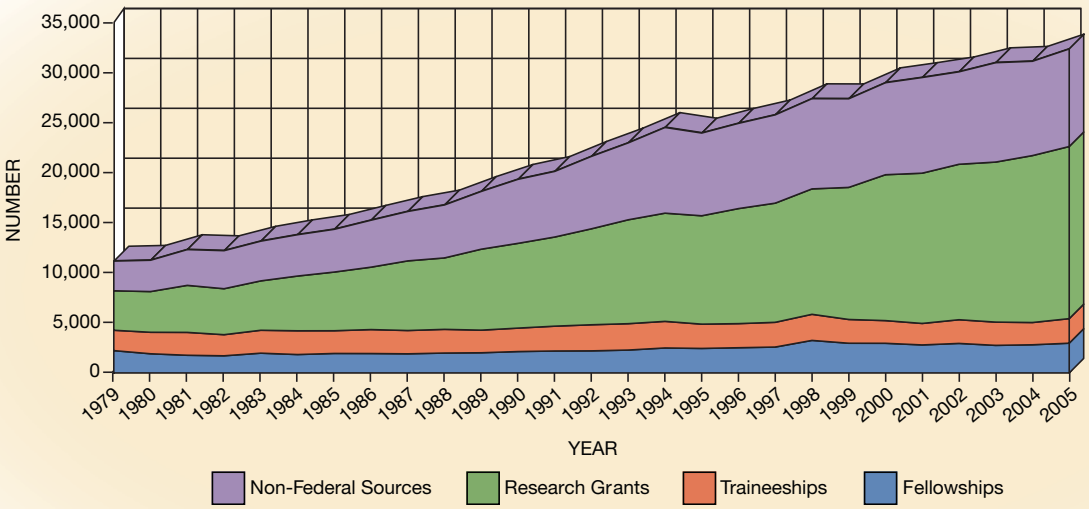
Biological and Medical Sciences Postdocs by Citizenship/Visa Status



From 1979 to 2005, the number of postdoctoral fellows that were U.S. citizens and permanent residents increased from 8,317 to 15,075. The number of postdoctoral fellows who were temporary residents increased from 2,949 to 17,564.

SOURCE: THE NATIONAL SCIENCE FOUNDATION SURVEY OF GRADUATE STUDENTS AND POSTDOCTORATES IN SCIENCE AND ENGINEERING (WWW.NSF.GOV/STATISTICS/GRADPOSTDOC/).

Biological and Medical Sciences Postdocs by Source of Support



In 1979, postdoctoral fellows received similar amounts of funding from non-federal sources, research grants, traineeships, and fellowships. This trend has changed over the last 25 years, and now most postdoctoral funding comes from non-federal sources and research grants.

SOURCE: THE NATIONAL SCIENCE FOUNDATION SURVEY OF GRADUATE STUDENTS AND POSTDOCTORATES IN SCIENCE AND ENGINEERING (WWW.NSF.GOV/STATISTICS/GRADPOSTDOC/).

The 2008 Herbert Tabor/ *Journal of Biological Chemistry* Lectureship: **I. Robert Lehman**

Lehman

The 2008 Herbert Tabor/*Journal of Biological Chemistry* Lecture will be given by I. Robert Lehman at next year's annual meeting. Lehman received the award for his outstanding scholarly contributions to the field of DNA metabolism, his admirable track record as a mentor, and his unparalleled service to the *Journal of Biological Chemistry*. He will present his lecture in San Diego on Saturday, April 5, at 6:00 pm.

Lehman's career in DNA metabolism research started in 1955 when he joined Arthur Kornberg's laboratory at Washington University in St. Louis as a postdoctoral fellow. During the next three years he and other members of the Kornberg laboratory discovered the first DNA polymerase, DNA polymerase I from Escherichia coli, and showed that it was a template-directed enzyme. This work eventually earned Kornberg one-half of the 1959 Nobel Prize in Physiology or Medicine.

In 1958, Lehman began independent research as an instructor in the Department of Microbiology at Washington University. There, he discovered many of the E. coli deoxyribonucleases and demonstrated their usefulness for studying nucleic acid structure. He left Washington University in 1959 to join the faculty of the Biochemistry Department at the Stanford University School of Medicine. Lehman continued his search for DNases in E. coli and other organisms and purified several of these enzymes.

In the late 1960s, Lehman started searching for a new area of research and decided to look for the enzymes that catalyzed the joining of DNA molecules. As he was purifying the polynucleotide joining enzyme, he became aware that several other laboratories were working on the same problem in a variety of organisms. Each group had its own name for the enzyme, but they all settled on "DNA ligase," and friendly competition between the labs ensued. Lehman was able to work out the complex mechanism of this enzyme involving multiple nucleotide transfer steps. His insights into the origins and closure of DNA nicks resulted in a critical study that determined the causes of the generation of small DNA fragments in the cell that had been erroneously designated as Okazaki fragments. These studies greatly contributed to the understanding of the mechanics of DNA replication in the cell.[1]

In the late 1970s, Lehman's inquisitive spirit led him to new directions of DNA research. He extended his DNA replication studies to eukaryotic and viral organisms, and he initiated homologous recombination studies in E. coli. His biochemical studies of DNA recombination catalyzed by the E. coli recA protein were among the first in the field and have become a template for subsequent analyses of recombination in eukaryotic cells.

Lehman was named William Hume Professor at Stanford University in 1980 and continues in this position today. He served as chairman of the Department of Biochemistry from 1974 to 1979 and from 1984 to 1986.

Lehman was president of ASBMB from 1997 to 1998, was on the editorial board of the *Journal of Biological Chemistry* from 1963 to 1968, and has served as an associate editor for the journal since 1981. "All of us working in the nucleic acid field are aware of Bob's devotion to the *Journal of Biological Chemistry*," says Charles C. Richardson, Edward S. Wood Professor of Biological Chemistry at Harvard Medical School. "It is always a pleasure to receive an e-mail notification that the associate editor for your manuscript is I. R. Lehman. Not only is the review prompt but also the reviewers always seem perfectly matched with the manuscript."

Lehman's stellar scientific output is matched by the large number of scientists who trained in his lab. "Bob has passed his excellence and insistence for quality and integrity in research to a number of students and postdocs who have had the privilege of working in his laboratory. Indeed, not only have these individuals been successful, they have also served the Society and the JBC in many major capacities," says Stuart Linn, Professor of the Graduate School Division of Biochemistry and Molecular Biology at the University of California Berkeley.

FOOTNOTE

1. More information on Lehman's research on DNA ligase can be found in his online *Journal of Biological Chemistry* Classic [1].

REFERENCE

J. Biol. Chem. **282**, 1, January 12, 2007.

The 2008 ASBMB Merck Award: **C. David Allis**


Allis

The 2008 ASBMB Merck Award will be given to C. David Allis, the Joy and Jack Fishman Professor at Rockefeller University, at the ASBMB Annual Meeting this April. He receives the award for his seminal contributions to the field of chromatin biology. Allis' research has helped to define cause and effect relationships between specific histone modifications and specific gene expression events. He has also aided in defining the enzymes and mechanisms involved in epigenetic regulation. Allis will present his award lecture on Monday, April 7, from 2:15 to 3:15 pm.

Allis, who received his Ph.D. in 1978 from Indiana University, first became interested in chromatin during his postdoctoral fellowship with Martin Gorovsky at the University of Rochester. He used the ciliated protozoan *Tetrahymena* as his model organism. He recalls, "This was a relatively new topic back then. It wasn't by any means the raging topic that it is today, and to think about doing chromatin biology in a super low, offbeat critter was not fashionable" [1].

After his postdoctoral fellowship was over, Allis became an assistant professor in the Department of Biochemistry at the Baylor College of Medicine in 1981. Over the next decade, he moved up the ranks and eventually became full professor in the Departments of Biochemistry and Cell Biology at Baylor. He then spent five years as a professor in the Department of Biology at Syracuse University before joining the faculty of the Department of Biology at the University of Rochester in 1995. Allis joined the faculty of the University of Virginia in 1998.

In 1996, Allis isolated a protein from *Tetrahymena* that was able to add an acetyl group to exposed lysine residues in histones. This was the first histone acetyltransferase (HAT) to be identified. He then showed that HAT from *Tetrahymena* was the homolog of a genetically defined transcriptional coactivator (GCN5) from yeast and that the yeast GCN5 coactivator had intrinsic HAT activity. This single observation immediately crystallized mechanistic concepts about direct linkages between histone acetylation and transcriptional activation.

A month after finding HAT, Allis characterized an enzyme that removed acetyl groups from histones. This histone deacetylase was related to a transcriptional corepressor in yeast.

The discovery that two enzymes that were involved in adding and subtracting acetyl groups to and from histones also enhanced or repressed transcription suggested a molecular mechanism for transcriptional regulation. "It wasn't rocket science to figure out this enzymatic pair of reactions might function as an on or off switch," said Allis. "Most people thought chromatin was just a passive platform that wraps the DNA. But those two papers made people think about a more active process in which chromatin truly participates" [1].

Moving on to yeast, Allis went on to provide the first definitive evidence that histones are physiological targets of GCN5 and are acetylated by GCN5 a specific residues, that the GCN5 HAT activity is required for transcriptional activation and targets promoter-proximal histones, and that histone acetylation is independent of, and thus causative for, transcription.

Beyond these critical histone acetylation studies, Allis has shown that histone H3 phosphorylation on an invariant serine is functionally linked to both mitosis and to mitogen stimulation of gene activity, that specific kinases are involved in this phosphorylation process, and that specific phosphorylation events can enhance specific acetylation events.

Allis has also made seminal observations on the role of histone methylation events in gene control. He has shown that the addition of methyl to certain lysine residues on histone H3 corresponds with the activation of transcription. He and his collaborators have also been instrumental in the identification of specific histone methyltransferases and the characterization of their corresponding complexes.

Based on observations of multiple histone modifications of the same histone tail, Allis formulated the "histone code" hypothesis, which posits that different modifications or combinations of modifications may act to form an epigenetic code that can be translated into different nuclear responses. More recently, Allis has extended this hypothesis and proposed new principles that include histone "modification cassettes" and "switches."

REFERENCE

[1] Downey, P. (2006) Profile of C. David Allis. *Proc. Natl. Acad. Sci. (U. S. A.)* **103**, 6425-6427.

Minority Student Conferences: ASBMB's Involvement

BY PHILLIP A. ORTIZ

Students gather at the 2006 ABRCMS Conference.

Each fall, members of ASBMB's Minority Affairs Committee (MAC) participate in two scientific meetings—one organized by the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) and the Annual Biomedical Research Conference for Minority Students—that are of particular interest to minority students. Since aligning with these meetings, the committee has become more actively engaged with each succeeding year and has increased ASBMB's visibility. At these meetings two members of the MAC with ASBMB meetings coordinator, Gail Pinder, "work the ASBMB booth" and participate as leaders in other aspects of the meeting.

The ultimate goal of both meetings is to enhance the educational experience and quality for all attendees by providing the students with many educational and professional development opportunities. At the ASBMB booth, volunteers and staff talk with dozens, if not hundreds, of undergraduate, graduate, and post-doctoral students and their faculty mentors who want to learn more about our organization. Other opportunities come in the form of student poster and oral presentations and by attending of many outstanding presentations and interactive sessions offered. A large number of these students are either directly involved in research, or at least are aware of its benefits, and are very often sponsored by federally funded minority programs, mostly from the National Institute of General Medical Sciences at the National Institutes of Health.

The SACNAS meeting (www.SACNAS.org) draws students from across many scientific disciplines and mathematics. SACNAS is a unique organization in that it highly values mentoring and development of young scientists. In fact, in recent years, two members of the ASBMB MAC have been honored with the "Award for Outstanding Mentor at an Undergraduate Institution." Tom Landefeld won the award in 2002, and Phillip A. Ortiz won in 2005. For a number of years Landefeld and Ortiz have also been leading a well attended session titled, "Career Development in the Biochemical Sciences: What Can Professional Societies Do for You?" In this session students are informed of the benefits they can expect from—as well as their responsibilities to—professional scientific societies. In addition to an engaging presentation, students are provided with a set of career materials and student centered literature from the ASBMB. The session is especially important because a large number of undergraduate students do not have extensive knowledge about professional scientific societies, and many other societies are present at the meeting, competing for the students' attention and possible membership.

The SACNAS meeting is very much like being with several thousand of your closest family members and friends. The environment is particularly warm and inviting as everyone freely shares their insights and expertise. No opportunity for mentoring, coaching, or providing support and encouragement is overlooked. Activities at this meeting include not just oral scientific and career sessions led by faculty but also student led poster and oral presentations and a highly engaging Pow Wow.

The second of the two meetings is the Annual Biomedical Research Conference for Minority Students (www.ABRCMS.org). This meeting, unlike SACNAS, focuses primarily on undergraduate students engaged in the biomedical sciences who wish to pursue scientific careers in this area. As such, our booth is overrun by many students who ask focused questions, gather literature, collect guidance and suggestions, and share their own stories of frustration and success.

In past years members of ASBMB MAC have played key roles in the ABRCMS meeting. For example, Landefeld and Ortiz have each served full terms on the meeting's steering committee and helped to formulate the priorities and agenda over the past six years. In addition, for a number of years, Ortiz has served as leader of the biochemistry and molecular biology sessions. In that role he has reviewed hundreds of abstracts for quality, reviewed travel award applications, moderated oral presentation sessions, and served as a judge for both the poster and oral presentations.

A Native American performer at a 2006 SACNAS Conference cultural event.
PHOTO CREDIT DALE HAMEISTER PHOTOGRAPHY.

Attendance at both meetings is driven by the desire to increase the visibility of our professional society, and MAC members spend much of their time proactively visiting students at their posters and meeting with the other exhibitors. During those visits, we introduce students to ASBMB sponsored student activities and the benefits of membership, and distribute the appropriate literature. Students are also recruited to participate in ASBMB's Annual Meeting and are encouraged to submit abstracts for the Undergraduate Poster Competition and to apply for travel awards. Committee members also expend considerable effort visiting with the directors of the students' training programs to explain the benefits of membership—not only what ASBMB can do for them but also how their membership will help drive the agenda in future years. Overall, ASBMB is showcased in the hope of establishing a relationship with the student and thus recruiting a loyal member and future leader in our organization.

The student work presented at both of these meetings is stringently pre-screened for scientific quality. Always astounding is the quality of the students' research, their ability to present and discuss it, and their depth of knowledge. As students present their posters, they are amid crowds of faculty mentors and research advisors as well as other engaged students. In fact, one of the students who presented a poster at ABRCMS later presented an improved version at the ASBMB Undergraduate Poster Competition—and he was awarded first prize!

These meetings each end in a festive award banquet. At these dinners, awards for outstanding poster and oral presentations are lauded. In recognition of the students' achievements, ASBMB has provided funding for many of the awards in the areas of biochemistry and molecular biology.

To improve our effectiveness, several significant steps were undertaken for this year's meetings. First, the MAC has funding for a significant number of complimentary student memberships. These memberships are intended to bring students into ASBMB. It is expected that in the short term these students would form Undergraduate Affiliate Network chapters, apply for travel awards, attend and present at our annual meeting, and participate in the Undergraduate Poster Competition. Such steps would all enhance their undergraduate education. In the long term, we expect that these students would continue their memberships and eventually become full members of ASBMB.

Also for this year's meetings a new booklet, titled *Diversity Provides the Answer: Unlocking Life's Secrets*, was distributed. This attractive, full-color, 12-page handout describes the career opportunities in biochemistry and molecular biology and provides insights into how students may best prepare themselves for the many educational and professional challenges that lie ahead. If you or your students would benefit from these materials, please request them via minorityaffairs@asbmb.org or download the PDF version from www.asbmb.org/minorityaffairs.

By the time these meetings are over, attendees are both exhausted and energized. They return to their home institutions with renewed focus and drive and are better prepared to deal with their educational pursuits. We look forward to attending and participating at these, and similar, meetings for many years to come!

2008 ASBMB

DNA & RNA Biology

Genome Dynamics: Replication, Recombination and Damage Response

- DNA Replication Mechanisms
- DNA Damage Response and the Cell Cycle
- Double-Stranded Breaks and DNA Recombination
- DNA Repair Mechanisms

Dynamic Chromatin and Gene Expression

- Chromatin Regulation of DNA Repair, Recombination, and Genome Stability
- Chromatin Structure in Gene Activation
- Chromatin Changes in Development
- Non-Coding RNAs in Gene Regulation and Chromosome Structure

RNA-Mediated Gene Expression

- Regulation of Nuclear RNA Metabolism
- Ribonucleoproteins
- RNA Transport and Localization
- RNA Turnover

Small RNAs and Dynamic RNA Elements

- Riboregulation
- Dynamic RNA Structures
- The Emerging Non-Coding RNA World
- Roles for Small Non-Coding RNAs

Molecular Structure & Dynamics

Protein Synthesis and Turnover

- Protein Turnover and Quality Control
- Protein Turnover in Cell Regulation
- Mechanisms of Protein Synthesis
- Protein-Assisted Folding and Misfolding

Form and Function of Molecular Machines

- Helicases
- Replication
- Gene Expression
- Filament Dynamics

Biomolecular Catalysis, Folding and Design

- Protein Interactions in Catalysis
- Enzymes as Drug Targets
- Energetics and Design
- Macromolecular Folding and Fluctuations

Cell Systems & Metabolism

Metabolism

- Metabolism and Diabetes
- Metabolism and Cancer
- Metabolism and Neurodegeneration
- Metabolic Networks

Systems Biology

- Global Systems Biology: Parts
- Global Systems Biology: Relationships
- Global Systems Biology: Dynamics
- Local Systems Biology: Subsystems and Simulation

Cell and Organelle Dynamics

- Cell Division
- Intracellular Dynamics
- Cell Migration
- Pathogen Exploitation of Host Machinery

Travel Awards

- **Graduate/Postdoctoral Travel Awards**
- **Graduate Minority Travel Awards**
- **Undergraduate Student Competitive Travel Awards**
- **UAN Faculty Travel Awards**
- **UAN Student Travel Awards**

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Abstract Submission Deadline: November 7, 2007

www.asbmb.org/meetings

Annual Meeting

Signaling

Lipid Signaling and Metabolism

- Tissue-Specific Regulation of Lipid Metabolism
- Lipids and Control of Gene Expression
- Stress and Lipid Metabolism
- Lipids and Inflammation

Signal Transduction

- Signaling in Disease and Therapy
- Growth Regulation
- Post-Translational Modifications
- G Proteins and Protein Kinases

ASBMB/ASPET

- Integration of Second Messenger Signaling
- The G-Whizards of GPCR/G-Protein Signaling
- G12/13 Signaling of Cell Surface Receptors: Molecular Insights and Disease Context
- Nicotinic Receptors and Ligand Gated Ion Channels

Chemical Biology

Chemical Biology

- New Strategies for Imaging Protein Localization and Dynamics
- Chemical Perspectives in Neurobiology
- Small Molecule Control of Protein Folding and Assembly
- Chemical Probes and Their Use in Identifying New Therapeutic Targets

Drug Discovery

- Drug Discovery in Academic Settings: Is There a Role for Academic Scientists in Early Drug Discovery
- Targets for Drug Discovery: Has Target-Based Screening Failed for Antibacterials?
- Targets for Drug Discovery: Nuclear Hormone Receptors
- Developing and Commercializing University Biomedical Inventions

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- Live Imaging of Developmental Processes
- Laser Capture Microdissection for Molecular Analysis
- Phenoms in the Phenome: Experts in Cellular Imaging from Single Molecules to Mice
- Principles and Application of Immunocytochemistry, (HCS Short Course)**

**Register at: www.histochemicalsociety.org

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- Drug Abuse

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- Assessment Issues Workshop
- Classroom of the Future III
- Incorporating Research into Formal Laboratory Courses Workshop
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- Writing Your First Grant Application Workshop

Public Affairs

- Advocacy Training for ASBMB Members

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ASBMB 5K Fun Run**

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Graduate/Postdoctoral Professional Development Program**

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How to Publish in the *JBC* Workshop**

Minority Scientists' Networking Mixer

Opening Reception and Dance

Research Funding by the American Cancer Society

Thematic Networking Receptions

Undergraduate Student Research Poster Competition**

Women Scientists' Networking Event

Young Experimental Scientists (Y.E.S.) Mixer

**Advance registration required

Going From *Saccharomyces cerevisiae* to the American Heart Association

BY DEREK T. SCHOLES

I am a government relations manager—a lobbyist—for the American Heart Association in the Office of Advocacy in Washington, DC. The purpose of the office is to pursue opportunities to change federal laws to reduce the incidence of heart disease and stroke. We advocate for a range of issues including increasing research funding, improving systems of care, and reducing the risk of disease. My policy portfolio includes promoting genetics in health care, reducing tobacco use, and addressing the obesity epidemic.

It was several years ago that I decided that I wanted to swap my lab coat for a suit and tie. Having gained my aBachelors degree and Ph.D. in Genetics from the University of Liverpool, United Kingdom, I was working as a postdoctoral fellow at the Wadsworth Center in Albany, New York. Although I was working on a fascinating project figuring out the regulation of mobile DNA elements in *Saccharomyces cerevisiae*, I had decided that I did not want to continue along the academic track, but I did want a career where I could use my scientific background. It was when Tom Murray, president of the Hastings Center, gave a lecture at the Wadsworth Center on various ethics issues related to science, that I was sold on pursuing a new career in science and health policy.

In retrospect, it was no surprise that a career in policy interested me: politics had always been a passion of mine. At home, Thomas Paine's *Common Sense* and *The Rights of Man* stood shoulder to shoulder with *The Origin of Species* and *The Selfish Gene* on my bookshelves. Aside from my postdoc work, I wrote articles for a local newspaper on issues such as campaign finance reform and the war in Iraq. And I was the person who, while spreading yeast cells on plates or preparing PCR reactions, would always discuss political issues of the day with anybody willing to chat.

Whereas working at the bench was something I still loved to do, getting into policy was something I knew I just *had* to do. But having solved the question, "What?", now I had to figure out "How?" I spent the next two years searching for the answer, seeking the advice from many experts in the field and sending off countless applications for any job, fellowship, or internship that could get my foot on the first rung of the science policy career ladder. However, I had no success. Meanwhile, I had to leave the yeast lab because of a funding shortage and worked as a staff scientist in an avian influenza lab at the Wadsworth Center while I continued to mail out applications. I questioned whether I would ever succeed and worried that my career was coming to a screeching halt.

Also during these two years, I became involved with the National Postdoctoral Association (NPA), a group that is interested in addressing training issues for young scientists. In the NPA, I gained policy experience through progressively senior positions, finally serving as vice chair

Derek T. Scholes

Derek T. Scholes is a government relations manager at the American Heart Association. He received his B.Sc. and Ph.D. in Genetics from the University of Liverpool, United Kingdom, and completed his postdoctoral training at the Wadsworth Center, Albany, New York. Prior to joining the AHA, Scholes worked in the Office of the Director at the National Human Genome Research Institute and subsequently in the health office of Senator Edward M. Kennedy in the U.S. Senate.

of the board. I became an invited speaker at university careers sessions and even testified before a National Academies Committee. My NPA experience strengthened my job and fellowship applications in a way I had not foreseen when I joined: I became much more knowledgeable about science policy and was now able to demonstrate my potential beyond the bench.

Two years of perseverance were finally rewarded in June 2005 with a phone call from Washington, DC, that changed my life. I had been chosen to be the National Human Genome Research Institute (NHGRI)/American Society for Human Genetics 2005–2006 Genetics and Public Policy Fellow. This was the perfect opportunity: a fellowship specifically designed for a young scientist wanting to transition from the bench to the policy world.

And what an opportunity! I spent the first four months of the fellowship in the Office of NHGRI Director Francis Collins, one of the country's preeminent scientists and who is deeply involved in policy issues raised by genetic research and the translation of research to enhance health care. I was given exposure to issues surrounding genetics discrimination and the Genetic Information Nondiscrimination Act (GINA), DNA patents, DNA profiling, and the use of family history in the clinical setting. I was intimately involved in a workshop convening experts from diverse fields to identify the most critical policy issues pertaining to expanding personalized medicine. And I was able to interact with all the leaders in the area of genetics policy in DC.

For the latter part of my fellowship, I worked for a year in Senator Kennedy's health office within the Senate Committee on Health, Education, Labor and Pensions, another fantastic opportunity. This was a job where I had to become fluent quickly in a broad range of completely different policy areas—from drug importation to dentistry, from trauma care to obesity. I worked on some of the hottest health topics of the year such as embryonic stem cell research and reauthorization of the National Institutes of Health (NIH). And I helped write legislation on the oversight of genetic tests. Working on the Hill expanded my knowledge of health care policy enormously and gave me an insider's view of the legislative process. Comparing it with my experience at the NIH, I completed the fellowship in December 2006 much more able to appreciate the different roles, advantages, and limitations of the legislative and executive branches of the federal government.

I had decided that I did not want to continue along the academic track, but I did want a career where I could use my scientific background.

I had been particularly impressed by the American Heart Association (AHA) during my interactions with the organization during my time on the Hill, so I was delighted when I was accepted for a position there at the beginning of 2007. It is an organization where a scientist can feel very much at home. Science has been a central part of AHA since its inception, and all of the policy positions adopted by AHA are based on firm scientific foundations.

Many of the skills I developed during my scientific training are transferable to policy. Instead of presenting my research results to support my conclusions, now I present heart disease and stroke data to Hill staff to advocate for policy changes. Where before I used critical thinking to analyze a scientific claim, now I apply it to weighing up whether AHA should support a policy position. In addition, working for an organization whose issues are based on science, it is greatly advantageous to both understand the science and have the research experience.

Just as scientific research can at times be frustrating and progress slow, advocating for changes in federal law can take years to achieve results. But, like scientists' curiosity drives them to repeat the experiment one more time, the motivation in policy is a passionate belief in the need for social change. Heart disease and stroke remain the number one and three killers in America today. Until this statistic changes, I will feel that I am making a valuable contribution to enhancing peoples' lives through influencing our government's policy.

How to Assess the Quality of Teaching

BY J. ELLIS BELL

Every year hundreds of faculty all over the country are either recommended for, or denied, tenure. While the tenure process varies significantly from institution to institution a component of the materials submitted by the candidate often includes some assessment of the "teaching" ability of the candidate. Unfortunately, while it is relatively easy to quantitate research productivity and service components of the tenure package, there is no clear cut way of assessing the quality of teaching.

In many institutions "Student Evaluation of Teaching" (SET) is the gold standard of teaching excellence. Unfortunately it is not a very reliable indicator of a person's ability to teach and has been criticized over the years by a variety of studies that have commented on its innate lack of ability to tell about the quality of instruction. Part of the problem is that what as a community we consider successful teaching is controversial: many, again despite contrary evidence, still think that the ability to stand in front of a class and deliver a well organized PowerPoint lecture is the pinnacle of teaching, along with the learning of quantitative problem solving by "repetition"—practice makes perfect is the refrain, but unfortunately students taught that way can rarely translate that "knowledge" to other similar problems—"you didn't" show us how to do that sort of problem in class" is the usual refrain. This occurs despite numerous studies showing that more student and learning centered approaches are far superior when it comes to student learning. It is far better, from the student learning perspective, to fully engage the students in the leaning process than to simply deliver information. Unfortunately it is far easier to simply "stand and deliver" the 50 minute PowerPoint lecture. Despite 15 to 20 years of promoting the clearly more effective approaches that revolve around active participation of the student in the learning process, the majority of teachers in most institutions still use the "stand and deliver" and the "drill and kill" approaches that foster rote learning and regurgitation on exams. Those that have developed or adopted innovative "best practice" approaches, that the available evidence shows work better, are usually in the minority.

How is this reflected in student evaluations of teaching? There are a number of problems: 1) students in general are not the best source of expertise on what good teaching is, 2) many students tend to like teachers who don't challenge them to think or to be actively involved in the learning process, 3) many students think that if they get an "A" or a high grade the teacher must be good, and 4) most students think that the "norm" is the best way to teach because after all that's what most of their teachers use, and they should know. The overall effect is that faculty that get high teaching evaluations using student evaluation of teaching are often those that challenge students to think the least and give predictable exams that reward memorization of facts rather than understanding of material or the ability to think. What about the more progressive teachers—what sort of SETs would be expected? In a given class there are, one hopes, some students who appreciate the fact that a teacher who actively engages them in the learning process and challenges them to think in class and on their exams is in reality doing his or her job well, whereas those who use

the stand and deliver and drill and kill approaches are really not contributing much to their education. These students will give their teacher a high rating while the majority will give medium or low ratings which will very much depend upon the nature of the questions used on the SET. A chair or administrator looking simply at SET values for these two teachers will conclude that one is excellent while the other is in some way lacking in ability to teach. Unfortunately these conclusions are exactly opposite to the reality.

So how should we assess the effectiveness of teaching? If the goal of teaching is that students learn something, then should we not base our assessment of teaching on whether or not students learn anything? Provided that there were appropriate tools to assess what students had learned in a given course or program, life would be simple. The teacher would administer the appropriate set of tools on the first day of class to establish what students knew or could do before the course started (it is really easy to convince students you are a wonderful teacher if you don't teach them anything and test them on what they already could do at the end of the previous semester) and again at the end of the course and a semester or more later to assess what students had learned during the course and were able to carry through to other courses—the real goal of an education and the mark of an excellent teacher is that their students still know "stuff" well after the final exam!

Many students think that if they get an "A" or a high grade the teacher must be good

What would it take for this to happen? The professional societies such as ASBMB must not only endorse such an approach but also make available validated assessment tools of student learning. Funding agencies, as most have done in the past 10 to 15 years, must continue to support those teachers who both innovate and validate in their teaching and clearly impact student learning and career development in positive ways. Department chairs and established faculty who use the stand and deliver and drill and kill approaches and claim that someone cannot be a good teacher because they don't teach like they do should be encouraged to step back and look at the evidence that clearly shows the benefits of incorporating active learning techniques even into standard lectures. The ideal class should incorporate aspects of classic lecture, active student learning and assessment of learning. To faculty who either are using such approaches or who want to use such approaches but are afraid of criticism from other faculty—keep the faith, but make sure that you demonstrate in an appropriate way that your students are learning at least as much as other students and then publish your approaches and validation in the appropriate academic journals.

A number of resources and literature related to this article are to be found on the Education and Professional Development Web pages at www.faseb.org/asbmb/epd/epd.html.

Life Science Education for the Real World

BY SHELDON M. SCHUSTER AND STEVEN CASPER

The explosion of technologies and information in biology has created unprecedented commercial opportunities within the applied life sciences. While there is no shortage of hyperbole (*e.g.*" The Biocentury"), biotechnology companies have helped to develop sufficient disease treatments, new food crops, and molecular diagnostics to support a distinctively optimistic vision for the future of this science-based industry. As a result of these successes and the continuing rush of not only new products, but also new technologies delivering ever more massive data sets, there is every reason to believe that many of our science graduates are going to be employed in this growing industry. Consequently, there should be an increase in interest by our students in careers in the emerging companies of the new millennium, and it is therefore timely to address the question: "How do we adequately educate our life science students for productive careers in this exciting new industry?"

The question of the best curriculum is complex, and it is likely there is not going be one answer for all colleges and universities, and students at different academic levels are going to require distinct curricula that fit a variety of needs. However, we can share our impressions and observations thanks to the efforts of our colleagues at the Keck Graduate Institute of Applied Life Sciences (KGI). These people held numerous long term discussions with industry leaders whose opinions were sought and (mostly) implemented in our professional graduate educational setting.

First and foremost, future leaders in a science-based industry must be technically competent. Our colleagues note with horror the employment of managers in corporations who lack the basic scientific understanding required to appreciate the technical issues central to the success of their corporate strategies. Executives who lack a significant level of scientific understanding find that making decisions is extremely difficult without endless technical analysis provided by those with the knowledge and expertise. Perhaps worse are the all too many cases of executives that "know the language" and derive a false sense of depth, often making uninformed and tragic decisions. This seems especially common among executives who over-promise delivery of practical applications of basic discoveries and who underestimate the technical challenges in the development portion of the production pipeline in general.

It is not necessary to delve deeply at this point into the specifics of the technical background required because there is rich curricular development in many of the basic life sciences. However, a consistent theme emerges from our discussions. Managers working in science-based industry must have the ability to understand the process of experimental design and data analysis as opposed to the specific techniques for data gathering. This skill set would be enhanced with experience or courses in informatics, statistics, and systems biology. But regardless of the specifics of the technical education desired in the future leaders, a consistent theme heard is that solid academic preparation in chemistry, physics, math, or any of the life sciences is far more valuable than any course work in the "soft skills" such as leadership, management, marketing, or strategy.

Solid academic preparation in chemistry, physics, math, or any of the life sciences is far more valuable

This is not to say that management education is not important. However, business curricula focused on the applied life sciences must avoid the "general management" orientation of many business schools and concentrate more specifically on the unique challenges facing science-based companies. These challenges include a special emphasis on technology strategy, entrepreneurship, and an understanding of how life science companies' strategies must be calculated within the complex regulatory processes that dominate any commercialization process for these industries. Moreover, management training must seriously integrate technical issues into the curricula. An especially valuable approach embraced at KGI has been to challenge students to dissect complex cases that involve layers of problems and a range of issues. In the world of business (outside of the laboratory) there are rarely problems that are strictly technical. Most real problems involve some level of technology that is impacted by time, money,

regulatory concerns, intellectual property issues, and often ethical considerations as well. Engaging this level of complexity is what distinguishes the higher levels of professionals from the technical specialists, and it is what is most difficult to teach in traditional classroom settings. It is in this realm where case-based teaching excels.

In our curriculum we nearly always use real problems as cases. There are numerous collaborators at neighboring institutions willing to provide technologies in need of detailed market analysis or even companies that have market, intellectual property, or regulatory problems that students might consider. These complex and real problems challenge the students because they know that there is no textbook guide to find the correct answer and that there are people looking to them for real results. These exercises require the ability to define a problem with great clarity, gather relevant facts, and sort and weigh data and information against potential ethical issues and their relative importance and value. All of this is the essence of critical thinking, and it is not easily taught or learned.

than any course work in the "soft skills" such as leadership, management, marketing, or strategy.

It should not be assumed that having the students pursue cases from real situations is easy pedagogically. A great deal of consideration by the instructor is required in choosing interesting and appropriate problems, mentoring and guiding the students during the work, and then carefully analyzing and constructively criticizing the result. However, our experience has been that the rewards of having the students fully engaged and excited while learning critical thinking skills is worth the effort.

An important corollary to case-based learning is an emphasis on teamwork as a primary method by which students learn. Professional education within the life sciences must embrace team-based learning. The importance of teams within science-based industry is driven by the complex, interdisciplinary work environments within these firms. No one student, however bright, can gain an expert knowledge in all areas impacting science-based firms; it is essential that students know how to work in multidisciplinary teams. This is more than humility; it is a real appreciation of the value and difficulty of working with teams of diverse individuals. It is noteworthy that our colleagues in industry agree that there are no classroom lessons in teamwork that are as effective as actually having to do it! They bemoan the lack of team experience in undergraduate curricula and note that team-based experiential learning is the one of the most effective means of learning and retaining broad concepts. Moreover they suggest that "leadership" is best learned from team experiences.

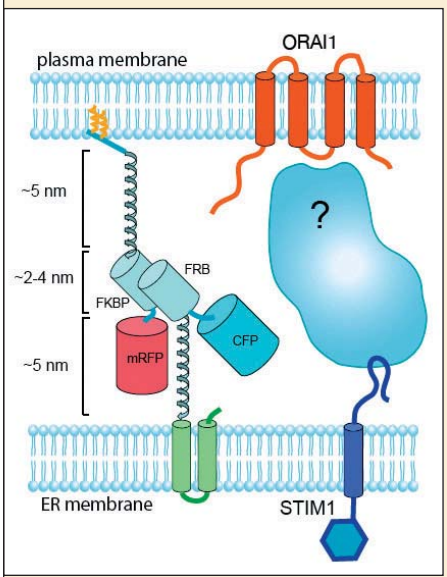
Our experience in this regard might be helpful in the design of team-based curricula. The kinds of problems that student project teams at KGI find most compelling are those that are "real" and not just fabricated for a classroom exercise. Perhaps the best example of team-based learning at KGI is our capstone student experience, the "Team Master Project (TMP)." At KGI we have substituted the typical individual student masters thesis with a year long contract research project in which students work as a team to solve an important problem for a client company. Projects are carefully crafted to blend technical and business challenges. While student teams work with a liaison from the corporate sponsor and have the support of KGI faculty advisors, students are given autonomy to create a division of labor within the team, negotiate project goals with the client, and to work towards the successful completion of the project. Students value the opportunity to apply their new professional skills to a "real world" problem, while corporate clients typically find that, in addition to the goodwill gesture of supporting KGI, most teams successfully complete the projects and, in doing so, help resolve important problems facing the companies. A significant validation of the team-based project approach is that KGI students have frequently obtained job offers from TMP sponsors and that nearly all sponsors return for more projects.

In our discussions with our colleagues in industry it has been rewarding to hear how much they value the graduates of our program, all of whom have experienced the team-based, hands on and real world curriculum. Appreciation is often expressed for their ability to work well in teams and to use their considerable ability to be adaptable and comfortable in situations of enormous complexity and a rapidly changing context of regulation and technical progress.

It is our hope to extend the concepts of this successful teaching model to other areas as well as various levels of science education. We would also welcome sharing experiences and material with others who have experimented in this area of curricular development so that we can all benefit from our efforts.

Visualizing Calcium Signaling

After many years of investigation, recent work has finally identified some of the key proteins involved in the almost ubiquitous process of store-operated calcium entry into cells. These proteins, a putative plasma membrane calcium channel named ORAI and an endoplasmic reticulum calcium sensor named STIM, are currently the subject of much investigation. In this *JBC* paper, the authors make two important contributions to this area of research. First, they describe a novel technological approach to both visualize and modify the contact sites that form between the plasma membrane and endoplasmic reticulum, thus allowing real-time and single cell studies of the activation and termination of store-operated calcium entry. Second, using these tools, the authors have obtained evidence that there are additional components involved in the formation and function of the complex that forms between ORAI1 and STIM1.



Orai1 interacts with a protein complex that bulges into the cytoplasm.

Visualization and Manipulation of Plasma Membrane-Endoplasmic Reticulum Contact Sites Indicates the Presence of Additional Molecular Components within the STIM1-ORAI1 Complex

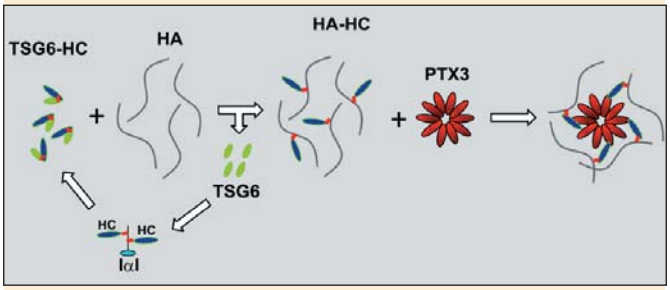
Peter Varnai, Balazs Toth, Daniel Toth, Laszlo Hunyady, and Tamas Balla

J. Biol. Chem. 2007 **282**, 29678–29690.

jbc

Organizing the Egg Matrix

Prior to ovulation, an expanded extracellular matrix consisting of a mesh-like network of hyaluronan forms around the mammalian oocyte. Previous studies have shown that three molecules are essential for the proper organization of hyaluronan in this matrix: inter-α-trypsin inhibitor (IαI), tumor necrosis factor induced protein-6 (TNFIP-6), and pentraxin 3 (PTX3). IαI is a complex macromolecule consisting of a chondroitin sulfate chain on bikunin, a trypsin inhibitor, and two proteins, referred to as heavy chains, covalently bound directly to the chondroitin sulfate. TNFIP-6 has been shown to be required to transfer heavy chains from IαI onto hyaluronan. In this paper, the authors show that heavy chains of IαI interact with the N-terminal domain of PTX3 and that this portion of PTX3 is required and sufficient for organizing the hyaluronan matrix. These results suggest that direct interactions between pentameric PTX3 and the heavy chains on hyaluronan are necessary to form the matrix around the oocyte that is essential for ovulation and for successful *in vivo* fertilization.



A model for the assembly of the cumulus matrix.

PTX3 Interacts with Inter-α-trypsin Inhibitor: Implications for Hyaluronan Organization and Cumulus Oophorus Expansion

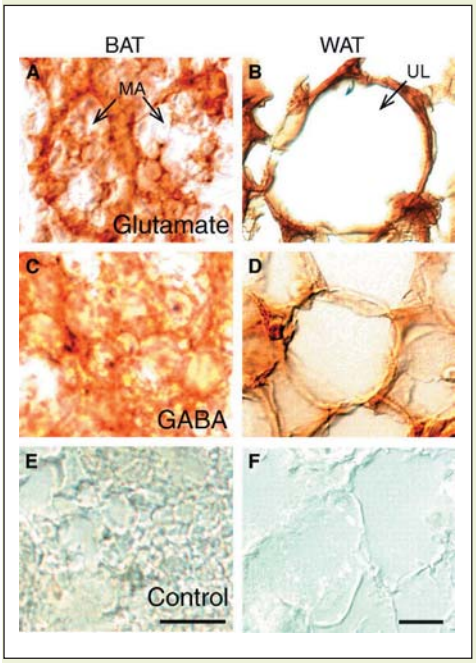
Laura Scarchilli, Antonella Camaioni, Barbara Bottazzi, Veronica Negri, Andrea Doni, Livija Deban, Antonio Bastone, Giovanni Salvatori, Alberto Mantovani, Gregorio Siracusa, and Antonietta Salustri

J. Biol. Chem. 2007 **282**, 30161–30170.

jbc

Fat: Not Just a Storage Organ

For a long time, adipose tissue was considered solely a primary energy storage organ. However, it has recently emerged as an important endocrine organ that produces and secretes compounds with modulating effects on food intake and energy homeostasis. In this paper, the authors used immunohistochemistry to look for components required for amino acid transmitter signaling in rat fat depots. They were able to detect robust immunosignals for the excitatory neurotransmitter glutamate, the inhibitory neurotransmitter γ-aminobutyric acid (GABA), and several isoforms of the GABA-synthesizing enzyme glutamate decarboxylase (GAD). They were also able to detect the vesicular transporters and receptors for glutamate and GABA in adipocytes. These findings indicate a paracrine signaling role for amino acids in adipose tissues.



Antibodies against glutamate and GABA bind to adipose tissue.

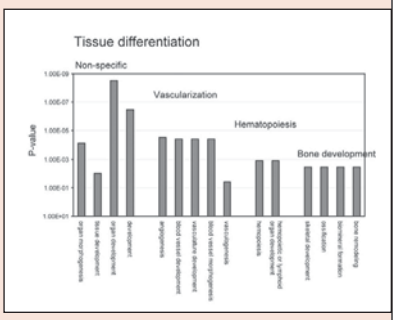
The Components Required for Amino Acid Neurotransmitter Signaling Are Present in Adipose Tissues

Anne Nicolaysen, Runhild Gammelsaeter, Jon Storm-Mathisen, Vidar Gundersen, and Per Ole Iversen

J. Lipid Res. 2007 **48**, 2123—2132.

The MSC Secretion Proteome

Mesenchymal stem cells (MSCs) are multipotent stem cells that have been used in clinical and preclinical applications to treat a wide range of diseases. Their mechanism of action is thought to be mediated either by their differentiation into functional reparative cells that replace injured tissues or by their secretion of paracrine factors that promote tissue repair. To determine whether or not paracrine factors are indeed involved in the wide spectrum of MSC-mediated therapeutic effects, the authors of this study assessed the secretion proteome of MSCs by performing multidimensional protein identification technology and cytokine antibody array analysis on a chemically defined culture medium conditioned by a line of MSCs. They found a total of 201 unique gene products, 29 of which had been previously reported to be secreted by adult tissue-derived MSCs. Computational analysis predicted that the gene products significantly drive three major groups of biological processes—metabolism, defense response, and tissue differentiation—and also activate important signaling pathways in cardiovascular biology, bone development, and hematopoiesis.



The gene products of the MSC secretion proteome are involved in tissue differentiation.

Elucidating the Secretion Proteome of Human Embryonic Stem Cell-derived Mesenchymal Stem Cells

Siu Kwan Sze, Dominique P. V. de Kleijn, Ruenn Chai Lai, Eileen Khia Way Tan, Hui Zhao, Keng Suan Yeo, Teck Yew Low, Qizhou Lian, Chuen Neng Lee, Wayne Mitchell, Reida Menshawe El Oakley, and Sai-Kiang Lim

Mol. Cell. Proteomics 2007 **6**, 1680—1689.

Bonnie Bassler: Understanding How Bacteria Communicate

BY PAT PAGES

During the past decade, scientists have discovered that bacteria are more social than assumed previously. They can communicate with chemical languages and form interactive communities that allow them to use resources more efficiently and better attack a host. Although this phenomenon, now called quorum sensing, was discovered in the 1960s, scientists are only now starting to understand how it works.

Bonnie Bassler, a Howard Hughes Medical Institute investigator and the Squibb Professor of Molecular Biology at Princeton University, New Jersey, is one of the first scientists who investigated quorum sensing in bacteria. She has spent the past 17 years unveiling the various ways bacteria talk to one another and, in the process, has helped reshape the way scientists think about bacteria.

"Bacteria are individual cells, but they can also work in communities, exactly the way people do," Bassler says. "For more than three centuries, bacteria were regarded simply as self-replicating machines, but their life is much richer—highly social and teeming with interactions with both friends and foes."

Bassler and other scientists have found that bacteria release hormone-like chemicals that allow them to recognize their peers, kill their enemies, or live in symbiosis with other species of cells. Her work, which started by looking at how a marine bacterium glows in the dark, has helped create a new field that examines how quorum sensing happens and may lead to novel treatments for bacterial diseases such as cholera and anthrax.

Early Interests in Science: Animals and Laboratory Work

During her childhood, Bassler grew up surrounded by all sorts of pets—dogs, cats, goldfish, and rodents. As a result, she wanted to become a veterinarian. She remembers spending her summers in Miami assisting the veterinarian at the city zoo and working in a small animal veterinary office. Bassler later worked in an aluminum manufacturing laboratory, which, she says, helped stimulate her logical reasoning and love of lab work. In school, she loved biology, chemistry, and physics classes, but she was more interested in doing experiments.

Bassler attended college at the University of California (UC), Davis, thinking she would become a veterinarian. But dissections made her faint, and she did not like memorizing in her biology classes, so she began taking courses in biochemistry and genetics. "I loved biochemistry and genetics because I could solve problems rather than memorize answers," Bassler says.

What she liked most was the practical side of what she was learning. In her junior and senior years, she did some research in the laboratory of Fredrick Troy, a professor of Biochemistry at UC-Davis Medical School, and Eric Vimr, now a professor of Pathobiology at the University of Illinois at Urbana-Champaign. Her work led to her first paper on how bacteria make polysialic acid, a process not well understood until then. "I just wanted to work in a lab, and the lab I wandered into happened to work on bacteria," Bassler says. "There I learned that bacteria are like stripped down versions of us and that researchers could actually do amazing science with them, which decided my career."

Bonnie Bassler

After graduating in biochemistry, Bassler went to The Johns Hopkins University to pursue a Ph.D. under the supervision of Saul Roseman, the Ralph S. O'Connor Professor of Biology. Bassler's research project—trying to understand how bacteria break down chitin, the most abundant sugar polymer in the ocean—was funded by the Office of Naval Research (ONR). She discovered that the bacteria are attracted by chitin and swarm toward it to eat it.

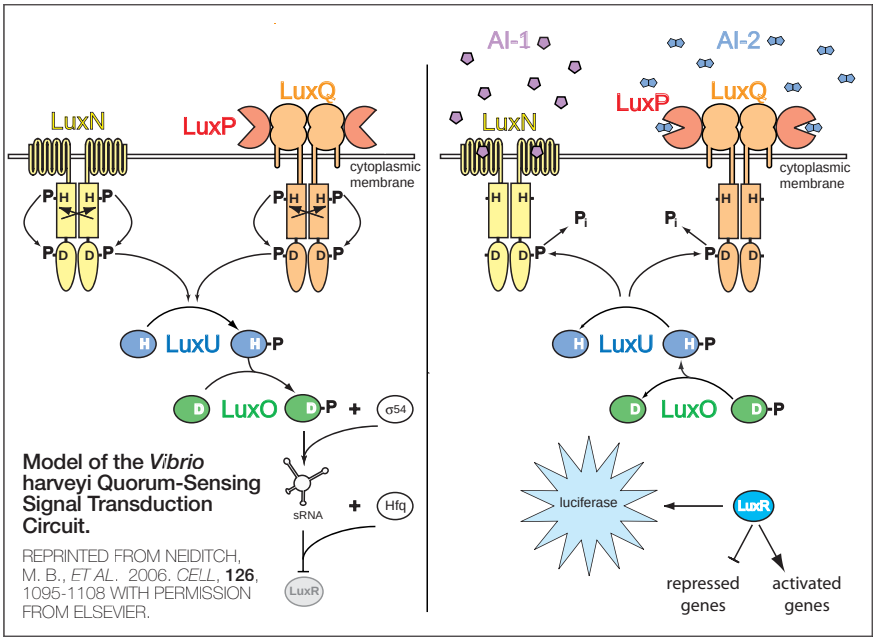
Fascinating Light Emitting Bacteria

In 1990, as she was finishing her Ph.D., Bassler went to a meeting organized by the ONR in Baltimore, Maryland. One of the presentations fascinated her. The speaker, Michael Silverman, director of The Agouron Institute, La Jolla, California, presented his latest findings on how a marine bioluminescent bacterium called *Vibrio fischeri* produces light. He discovered the mechanism underlying how these bacteria, which live as symbionts in a squid's light organ, release a chemical that helps them sense how many other bacteria surround them and, if enough bacteria are present, light up together.

Bassler was so astonished to hear—for the first time in her life—that bacteria could communicate and then work together that she ran up to Silverman after his presentation and told him that she would love to work on this with him. Silverman was eager to share his interest in this research area since, at that time, only a few scientists were studying bioluminescent bacteria, a topic that was considered by most scientists a sideline curiosity with no potential application.

After she finished her Ph.D., Bassler went to work with Silverman at The Agouron Institute as a postdoctoral fellow and later as a research scientist. During her four years at the institute, she unraveled the molecular mechanisms that explain quorum sensing in *Vibrio harveyi*, a close cousin of *V. fischeri* that lives in the open ocean instead of in animal hosts.

Bassler found that *V. harveyi* produces and responds to two chemicals, called autoinducers, that trigger gene expression changes in each bacterium so that they can glow together. She named these molecules autoinducer-1 (AI-1) and autoinducer-2 (AI-2). She also identified the receptors to which the two autoinducers bind and found some of the proteins that are subsequently activated to generate the genetic changes necessary for bioluminescence.



Model of the *Vibrio* harveyi Quorum-Sensing Signal Transduction Circuit.

REPRINTED FROM NEIDITCH, M. B., *ET AL.* 2006. *CELL*, **126**, 1095-1108 WITH PERMISSION FROM ELSEVIER.

Universal Bacterial Language

In 1994, Bassler was hired by Princeton University as an assistant professor. There, she pursued her research on *V. harveyi* and was very surprised to discover that AI-1 was used by the bacteria to communicate with their *V. harveyi* neighbors, whereas AI-2 helped *V. harveyi* to talk with many other types of bacteria. Bassler then found that AI-2 was also made and used by other bacteria to communicate with one another. "In the world of bacteria, AI-2 represents a universal language, a 'bacterial Esperanto,'" Bassler says.

This discovery showed for the first time not only that *V. harveyi* used two different "languages," but also that one of them was common to most other known bacteria. "I had no idea that bacteria could use more than one language," Bassler says. "I was even more surprised to discover that bacteria use a common language in addition to their own private language."

For bacteriologists, the existence of AI-2 was a revelation. It meant that the bacteria they were studying had an unsuspected property that could help them understand the way bacteria interact with their neighbors. The number of scientists working on quorum sensing started to grow, and Bassler was thrilled by this surge of interest in her field of research.

In 2002, Bassler and Fred Hughson, a structural biologist at Princeton, published the structure of AI-2 by trapping the molecule in the *V. harveyi* receptor and solving the crystal structure of the complex. This and subsequent work showed that AI-2 is a family of interchangeable molecules, all derived from a common precursor molecule. Bassler showed that some bacterial species choose differently rearranged forms of AI-2 to communicate with one another. "These spon-

taneous rearrangements provided a biochemical explanation for how AI-2 can be a universal language among bacteria," Bassler says.

Later, Bassler found that *V. harveyi* produces a third autoinducer called CAI-1 and uses it to communicate with other *Vibrio* bacteria. "Additional autoinducers will likely be found, given the fact that the field of quorum sensing is still pretty new, and our understanding of the chemical lexicon is still primitive," Bassler says.

Biochemistry of Quorum Sensing

Bassler and her team also provided the biochemical details explaining how *V. harveyi* performs quorum sensing and emits light. She showed that AI-1, AI-2, and CAI-1 bind to separate membrane proteins, called LuxN, LuxPQ, and CqsS , respectively (see figure), and then transduce information into a common signaling pathway.

When the bacteria are alone or surrounded by only a small number of their peers, the three membrane proteins act as kinases by transferring a phosphate to a protein called LuxO. The phosphorylated LuxO inhibits production of a protein called LuxR that activates bioluminescence. When many cells are present, the autoinducers they emit bind to their receptors, which leads to the dephosphorylation of LuxO and the production of LuxR, which allows the cells to emit light.

In 2004, Bassler and colleagues were trying to find proteins that seemed to be missing from this signaling pathway when they made the surprising discovery that the central step in the pathway is controlled by small, non-coding RNAs. These RNA molecules work by altering the translation of proteins. Small RNAs had been discovered in eukaryotes in 1998, but Bassler's team did not expect to find them involved in quorum sensing.

"We were stunned," she says. "For all these years, we had been looking for proteins, and we suddenly realized that we should have been looking for small RNAs. We now know that small RNAs are 'running the show' in quorum sensing."

Quorum Sensing's Promising Prospects

For the past five years, Bassler has been studying quorum sensing in a number of pathogens, reasoning that a better understanding of quorum sensing in harmful bacteria could lead to the development of new antimicrobial therapies. The general idea is to prevent harmful bacteria from working together while encouraging useful bacteria to do so. "Inhibiting quorum sensing in disease causing bacteria offers an attractive alternative to traditional antibiotics," Bassler says. "We would not attack the bacteria directly but prevent them from talking to one another and initiating virulence, and then let the immune system do the rest."

"We would not attack the bacteria directly but prevent them from talking to one another and initiating virulence."

Understanding how bacteria communicate could help us understand how cells in higher organisms talk to one another. Scientists have found that bacterial and eukaryotic cell-cell communication may share common origins. For example, *Providencia stuartii*, a bacterium that causes infections that are contracted in hospitals, requires a protein called AarA to release its autoinducer. AarA is similar to Rhomboid, a protein involved in releasing a chemical signal in the early development of fruit flies.

Evidence that AarA and Rhomboid have a shared function comes from the discovery that artificially expressing AarA rescued wing-vein development in a fruit fly Rhomboid mutant in which the veins do not develop properly. Conversely, introducing the fly Rhomboid gene into an AarA mutant *P. stuartii* restored quorum sensing.

These results suggest that AarA and Rhomboid diverged from a common evolutionary ancestor protein and hint at the possible existence of other shared cell-cell communication mechanisms in bacteria and eukaryotes. If such functions are discovered, they may reveal how cells that form tissues and organs in eukaryotes communicate.

Bassler is very excited about what she learns everyday about the social lives of bacteria. "Only a very small fraction of the Earth's bacteria have been identified, much less cultivated in the laboratory," she says. "We may have just begun to eavesdrop on a microbial agora—a bustling world of chemical languages, each with its own biological story to tell."

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career opportunities

Brigham Young University

THREE CONTINUING STATUS TRACK FACULTY POSITIONS

The Department of Microbiology and Molecular Biology at Brigham Young University announces the availability of three continuing status track faculty positions. Review of applications will begin December 14, 2007 and continue until each position is filled. For these positions, applicants should have a doctoral degree and post-doctoral research experience, and must demonstrate a high potential for establishment of an externally funded research program. Successful candidates must demonstrate a strong teaching capability at both undergraduate and graduate levels and are expected to mentor both graduate and undergraduate students.

Virology. The successful candidate is expected to develop a strong teaching capability in virology covering classical and molecular animal virology. Candidates must have a research emphasis in animal virology and demonstrate facility with current laboratory and conceptual tools.

Molecular Cell Biology. The successful candidate is expected to develop a strong teaching capability in molecular and cellular biology. Candidates should have a research emphasis in an area of cell biology and demonstrate facility with current methodology.

Prokaryotic Biology. The successful candidate is expected to develop a strong teaching capability in prokaryotic biology. Candidates must have a research emphasis in a prokaryotic model and demonstrate facility with current methodology.

Applicants must apply online at http://yjobs.byu.edu through faculty application; attach curriculum vitae, and one-page statements of Teaching Philosophy and Research Interests and Goals.

For further information, contact Dr. Brent Johnson, Chair, Search Committee, Department of Microbiology and Molecular Biology, Brigham Young University, Provo, UT 84602, USA. (Phone: 801-422-2331. E-mail: brent_johnson@byu.edu). Additional departmental information is available at http://mmbio.byu.edu.

BYU is an equal employment opportunity employer. Preference is given to qualified members in good standing of the sponsoring church, The Church of Jesus Christ of Latter-day Saints.

Kansas City University of Medicine & Biosciences

FACULTY POSITION IN BIOCHEMISTRY

Kansas City University of Medicine and Biosciences invites applications from outstanding candidates for appointment in the Department of Biochemistry at the rank of Assistant or Associate Professor. As we continue to expand our research capacity, we seek candidates with research interests in the chronic diseases of aging, particularly diseases associated with protein misfolding; applicants who can produce new knowledge in the areas of chemical neurobiology using innovative techniques are especially encouraged to apply. The successful applicant will have a Ph.D. (or equivalent doctorate), a record of scholarly publications and progressive external funding, be willing to mentor graduate and medical students and to contribute to a novel instructional curriculum.

For additional information, contact Norbert W. Seidler, Ph.D., Chair, Department of Biochemistry, 1-800-234-4847, ext. 2207 or 816-283-2207, nseidler@kcumb.edu. Please visit www.kcumb.edu and click on 'Employment' to view remainder of ad and for CV submission directions.

University of Colorado School of Medicine

CHAIR, DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR GENETICS

The University of Colorado School of Medicine seeks applicants for Chair of the Department of Biochemistry and Molecular Genetics. The Department consists of 17 primary faculty as well as more than 20 secondary faculty members. The Department currently occupies over 35,000 square feet of state-of-the-art research and office space, primarily on the 9th and 10th floors of the newly occupied Research Complex at the new UCHSC Fitzsimons campus.

Details are available at the departmental web site: http://www.uchsc.edu/sm/bbgn/

Research programs include chromatin structure, gene transcription and translation, RNA structure and enzymatic activity, protein structure, protein degradation, signal transduction, cell cycle regulation, bioinformatics and cell fate determination. Department faculty, currently with over eight million dollars in federal funding, houses the Molecular Biology, Biomolecular Structure, Biomedical Sciences and Biochemistry graduate programs. In addition, department faculty draw graduate students from several other programs including: MSTP, Bioinformatics, and Neuroscience.

The Chair of the Department of Biochemistry and Molecular Genetics reports to the Dean of the School of Medicine and participates with his staff and other departmental chairs in program development, administration, and budgetary planning and implementation. The position requires excellence in teaching, demonstrated administrative leadership and ability, and, in particular, leadership in research and scholarly activity.

The University of Colorado is committed to the recruitment and employment of a diverse faculty. We encourage applications from women and minorities. Review of applications will continue until the position is filled. Applicants should respond by sending a letter of interest and curriculum vitae to:

John C. Cambier, Ph.D.
Ida and Cecil Green Professor and Chairman of the Department of Immunology,
Chair, Department of Biochemistry and Molecular Genetics Search Committee
University of Colorado School of Medicine and National Jewish Medical and Research Center,
Room K803
1400 Jackson Street, Denver CO 80206
Fax: [303] 270-2325
Email: Durans@NJC.org

The University of Colorado is committed to diversity and equality in education and employment.

Biofocus, DPI, Inc.

PROJECT COORDINATOR POSITION

Molecular Libraries Small Molecule Repository (MLSMR) Project Coordinator Position Needed in our South San Francisco, California Office. Ideal candidate will have at least 3 years of high throughput screening (HTS) or Compound Management experience.

Please see a full job description on our website at www.biofocusdpi.com under careers/related links/BioFocus DPI job openings/South San Francisco USA. Compensation determined upon experience.

University of Texas at Austin

STRUCTURAL BIOLOGIST

Tenure Track Faculty The Department of Chemistry & Biochemistry at the University of Texas at Austin seeks outstanding structural biologist candidates for a tenure-track Assistant Professor position. One of our focus areas is RNA/protein or small RNAs, to complement the already strong RNA biology group here at UT Austin. Exceptional candidates in other areas of biochemistry and at other ranks will also be considered.

Candidates should forward a cover letter indicating their area of expertise, a curriculum vitae, a description of research plans, and list of three individuals who will send letters of reference to: Faculty Search Committee, Department of Chemistry & Biochemistry, The University of Texas at Austin, 1 University Station—A5300, Austin, TX 78712-0165.

The University of Texas is building a culturally and ethnically diverse faculty and strongly encourages applications from women and underrepresented minority candidates.

The University of Texas is an Equal Opportunity and Affirmative Action Employer. The application should be received by October 16, 2007; however, late applications may be considered.

Electronic applications (cover letter, CV, description) in PDF form are welcome and should be sent to John Baxendale, jbaxendale@mail.utexas.edu. Visit www.cm.utexas.edu for more information about the Department.

University of California—Berkeley

POSTDOCTORAL POSITION

Highly motivated candidates are invited to apply for a postdoctoral position to study the role of lipid autacoids in the ocular inflammatory and wound healing response. Applicants must have a strong biochemical/molecular biology background. Experience in the molecular biology and biochemistry of eicosanoids and related pathways is highly desired. Experience in LC/MS/MS and related analytical methods are a plus. The successful candidates must be able to work independently and as part of a multidisciplinary and highly interactive team. Excellent verbal and written communication skills are required with a strong record of relevant publications. The University of California, Berkeley provides an outstanding research, academic and cultural environment. The Bay Area is widely regarded as one of the best places to live. The University of California is an equal opportunity, affirmative action employer. Women and minorities are encouraged to apply.

Interested candidates should e-mail a complete CV and a list of three references to:
Karsten Gronert, Ph.D.
Acting Associate Professor
Solon M. and Pearl A. Braff Chair in Clinical Optometric Science
University of California, Berkeley
School of Optometry
594 Minor Hall, MC 2020
Berkeley, CA 94720-2020
Email: kgronert@berkeley.edu

University of Minnesota

POSTDOCTORAL RESEARCH ASSOCIATE

Postdoctoral Research Associate, University of Minnesota, Departments of Bioproducts & Biosystems Engineering and Plant Biology. Position available immediately in joint project between Profs. Simo Sarkanen and J. Stephen Gantt devoted to lignin-depolymerase-catalyzed degradation of lignin in the biofuels area. Work involves protein purification & characterization, enzyme activity analyses, de novo mass spectroscopic peptide sequencing, gene cloning, and protein expression. Candidates must have Ph.D. degree in chemistry, biochemistry, molecular biology or appropriately related field with a solid background in protein chemistry and practical molecular biology. Initial one-year appointment with $35,000–$38,000 annual salary may be extended on basis of performance and availability of funds.

Please send CV and graduate transcripts with names and contact information for three references, as well as two relevant publications, to: Prof. Simo Sarkanen, 203 Kaufert Lab., University of Minnesota, 2004 Folwell Ave., St. Paul, MN, 55108-6128, sarka001@umn.edu. Review of applications will begin as received.

The University of Minnesota is an equal opportunity educator and employer.

University at Buffalo (State University of New York)

TENURE TRACK POSITIONS

Tenure track positions at all ranks are available in the Department of Physiology and Biophysics, School of Medicine and Biomedical Sciences, in the University at Buffalo, State University of New York. We are seeking candidates interested in using molecular, cellular, genetic and/or computational approaches to study signaling networks, molecular and cellular basis of human disease, single molecule interaction, cell differentiation and development. The ability to lead productive collaborative research will be considered in evaluation of applicants for senior positions.

Additional information on the Department may be obtained by contacting Dr. Harold C. Strauss, Professor and Chair at hstrauss@buffalo.edu, or at www.smbs.buffalo.edu/phb. Applications in a single PDF file that includes C.V., brief statement of research interests, and the names and email addresses of three references should be submitted at http://www.ubjobs.buffalo.edu (posting #0601624).

The University at Buffalo is an Affirmative Action/Equal Opportunity Employer. Women and Minorities are encouraged to apply.

University of Illinois at Chicago Department of Pharmacology

INSTRUCTOR POSITION

The Department of Pharmacology at UIC is seeking candidates for an Instructor position. The applicant should have a MD or PhD, research expertise in molecular biology/biochemistry, and a credible publication record. Position available December 16, 2007.

For fullest consideration send CV by 12/1/07 to: Search Committee (I001), Department of Pharmacology, University of Illinois at Chicago, 835 S. Wolcott, Room E403, MC 868, Chicago, IL 60612.

UIC is an AA/EOE.

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ARC 1582	Guanosine diphosphate glucose, [α-D-glucose-^{14}C(U)]	10 µCi	$1849
ARC 0440	Guanosine diphosphate mannose [mannose 2-^{3}H]	50 µCi	$1099
ARC 0116	Inositol [2-^{3}H(N)]	1 mCi	$729
ARC 0127	Mannitol, D-[1-^{14}C]	250 µCi	$1049
ART 0118	Mannitol, D-[1-^{3}H(N)]	5 mCi	$899
ARC 0129	Mannose, D-[1-^{14}C]	250 µCi	$1399
ART 0120	Mannose, D-[2-^{3}H(N)]	5 µCi	$899
ARC 0322	Methyl-β-D-thiogalactopyranoside, [methyl-^{14}C]	50 µCi	$849
ARC 0221	Octyl-β-D-glucopyranoside, [glucose-^{14}C(U)]	50 µCi	$1099
ARC 0157	Ribitol, D-[1-^{14}C]	50 µCi	$899
ARC 0137	Ribose, D-[1-^{14}C]	50 µCi	$659
ART 0152	Ribose, D-[1-^{3}H]	1 mCi	$799
ARC 0143A	Sucrose, [^{14}C(U)]	1 mCi	$1099
ARC 1379	UDP N-acetyl-D-galactosamine, [1-^{14}C]	10 µCi	$1199
ART 0156	UDP N-acetyl-D-galactosamine, [6-^{3}H(N)]	50 µCi	$649
ART 0131	UDP galactose, [galactose-6-^{3}H]	250 µCi	$749
ARC 0151	UDP Glucose [glucose ^{14}C(U)]	5 µCi	$749
ART 0525	UDP Glucose [glucose-1-^{3}H]	250 µCi	$749
ARC 1744	Xylitol, D-[1-^{14}C]	250 µCi	$799
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scientific meeting calendar

NOVEMBER 2007

HIV/AIDS Research at the National Cancer Institute: *A Record of Sustained Excellence Symposium*
NOVEMBER 1–2, 2007
BETHESDA, MD
web.ncifcrf.gov/events/hivaidsresearch2007/

The Liver Meeting 2007 Annual Meeting of the American Association for the Study of Liver Diseases
NOVEMBER 2–6, 2007
BOSTON, MA
https://www.aasld.org/eweb/DynamicPage.aspx?webcode=07am

44th Japanese Peptide Symposium
NOVEMBER 7–9, 2007
TOYAMA, JAPAN
peptide-soc.jp/english/engindex.html
E-mail: jps@peptide.co.jp

20th Annual Tandem Mass Spectrometry Workshop
NOVEMBER 28–DECEMBER 1, 2007
LAKE LOUISE, ALBERTA, CANADA
www.csms.inter.ab.ca

Annual Biomedical Research Conference for Minority Students
NOVEMBER 7–10, 2007
AUSTIN, TX
www.abrcms.org/index.html

Annual Meeting of the Society for Glycobiology
NOVEMBER 11–14, 2007
BOSTON, MA
www.glycobiology.org

DECEMBER 2007

The 47th American Society for Cell Biology Annual Meeting
DECEMBER 1–5, 2007
WASHINGTON, DC
ascb.org/meetings/

2007 Congress of the Swiss Proteomics Society: Pushing the Limits
DECEMBER 3–5, 2007
LAUSANNE, SWITZERLAND
sps07.swissproteomicsociety.org

EuroTIDES
DECEMBER 3–6, 2007
BERLIN, GERMANY
www.iir-events.com/IIR-conf/SearchEvents.aspx

JANUARY 2008

Keystone Symposium—Frontiers of Structural Biology
JANUARY 6–11, 2008
STEAMBOAT SPRINGS, CO
www.keystonesymposia.org
E-mail: info@keystonesymposia.org

Keystone Symposium—Structural Genomics and Its Applications to Chemistry, Biology & Medicine
JANUARY 6–11, 2008
STEAMBOAT SPRINGS, CO
www.keystonesymposia.org
E-mail: info@keystonesymposia.org

Keystone Symposium—Eicosanoids and Other Mediators of Chronic Inflammation
JANUARY 7–12, 2008
BIG SKY, MT
http://www.keystonesymposia.org/Meetings/ViewMeetings.cfm?MeetingID=939

The Sanibel Conference: Ion Mobility and Related Emerging Areas
JANUARY 18–21, 2008
DAYTONA BEACH, FL
www.asms.org

Keystone Symposium—Diabetes Mellitus, Insulin Action and Resistance
JANUARY 22–27, 2008
BRECKENRIDGE, CO
http://www.keystonesymposia.org/Meetings/ViewMeetings.cfm?MeetingID=922

FEBRUARY 2008

Joint Meeting of the Biophysical Society 52nd Annual Meeting and 16th International Biophysics Congress
FEBRUARY 2–6, 2008
LONG BEACH, CA
http://www.biophysics.org/meetings/2008/

Regulatory RNA in Biology and Human Health
FEBRUARY 2–6, 2008
MIAMI BEACH, FL
http://www.med.miami.edu/mnbws/

Keystone Symposium—Biomarker Discovery, Validation and Applications
FEBRUARY 3–8, 2008
TAHOE CITY, CA
www.keystonesymposia.org

Drug Discovery for Neurodegeneration
FEBRUARY 4–5, 2008
WASHINGTON, DC
www.alzdiscovery.org/

International Conference on Neural Signaling: *Opportunities for Novel Diagnostic Approaches and Therapies*
FEBRUARY 16–20, 2008
PACIFIC GROVE, CA
medicine.ucsf.edu/conferences/asilomar2008/index.html
E-mail: robert.chan@ucsf.edu
Tel.: 415-476-9892

Peptides, Chemistry & Biology Gordon Research Conference
FEBRUARY 17–22, 2008
VENTURA BEACH, CA
www.gre.org

Keystone Symposium—Molecular Control of Adipogenesis and Obesity
FEBRUARY 19–24, 2008
BANFF, CANADA
http://www.keystonesymposia.org/Meetings/ViewMeetings.cfm?MeetingID=918

1st International Conference on Advanced Technologies & Treatments for Diabetes
FEBRUARY 28–MARCH 2, 2008
PRAGUE, CZECH REPUBLIC
http://www.kenes.com/attd

MARCH 2008

US HUPO 4th Annual Conference
MARCH 16–19, 2008
BETHESDA, MD
www.ushupo.org
E-mail: ushupo@ushupo.org
Tel.: 505-989-4876

Genomes to Systems 2008
MARCH 17–19, 2008
MANCHESTER, UK
www.genomestosystems.org/

42nd Annual Scientific Meeting of the European Society for Clinical Investigation (ESCI)
MARCH 26–29, 2008
GENEVA, SWITZERLAND
www.esci.eu.com/default.asp?page=meetings&file=future

Keystone Symposium—Nuclear Receptors: Orphan Brothers
MARCH 30–APRIL 4, 2008
WHISTLER, CANADA
www.keystonesymposia.org/Meetings/ViewMeetings.cfm?MeetingID=956

Keystone Symposium—Nuclear Receptors: Steroid Sisters
MARCH 30–APRIL 4, 2008
WHISTLER, CANADA
www.keystonesymposia.org/Meetings/ViewMeetings.cfm?MeetingID=957

APRIL 2008

ASBMB Annual Meeting *in conjunction with EB2008*
APRIL 5–9, 2008
SAN DIEGO, CA
Contact: ASBMB 2008, 9650 Rockville Pike, Bethesda, MD 20814-3008
www.asbmb.org/meetings
E-mail: meetings@asbmb.org
Tel.: 301-634-7145

Vascular Biology 2008 in conjunction with American Society for Investigative Pathology at Experimental Biology 2008
APRIL 5–9, 2008
SAN DIEGO, CA
www.navbo.org/vb08.htm

International Conference on Cellular and Molecular Biology: *A satellite meeting of the 4th World Congress on Cellular and Molecular Biology*
APRIL 6–8, 2008
INDORE, INDIA
Please submit your CV and proposal to:
E-mail: ak_sbt@yahoo.com

Arteriosclerosis, Thrombosis, and Vascular Biology Annual Conference 2008
APRIL 16–18, 2008
ATLANTA, GA
www.americanheart.org/presenter.jhtml?identifier=1201

MAY 2008

Keystone Symposium—G-Protein Coupled Receptors
MAY 18–23, 2008
KILLARNEY, IRELAND
www.keystonesymposia.org/Meetings/ViewMeetings.cfm?MeetingID=908

Gordon Research Conference on Thiol-based Redox Regulation and Signaling
MAY 25–30, 2008
IL CIOCCO, ITALY
Chair: Ruma Banerjee.
Vice Chair: Roberto Sitia
www.grc.org
E-mail: rbanerje@umich.edu

JUNE 2008

33rd FEBS Congress & 11th IUBMB Conference
JUNE 28–JULY 3, 2008
ATHENS, GREECE
www.febs-iubmb-2008.org

AUGUST 2008

HUPO 7th Annual World Congress
AUGUST 16–21, 2008
AMSTERDAM, THE NETHERLANDS
www.hupo2008.com
E-mail: Wehbeh.Barghachie@mcgill.ca
Tel.: 514-398-5063

30th European Peptide Society Symposium
AUGUST 31–SEPTEMBER 5, 2008
HELSINKI, FINLAND
www.30eps.fi/
E-mail: 30eps@congrex.fi
Tel.: 358-(0)9-5607500

SEPTEMBER 2008

Workshop: Biology of Signaling in the Cardiovascular System
SEPTEMBER 11–14, 2008
HYANNIS, MA
www.navbo.org/BSCS08Workshop.html

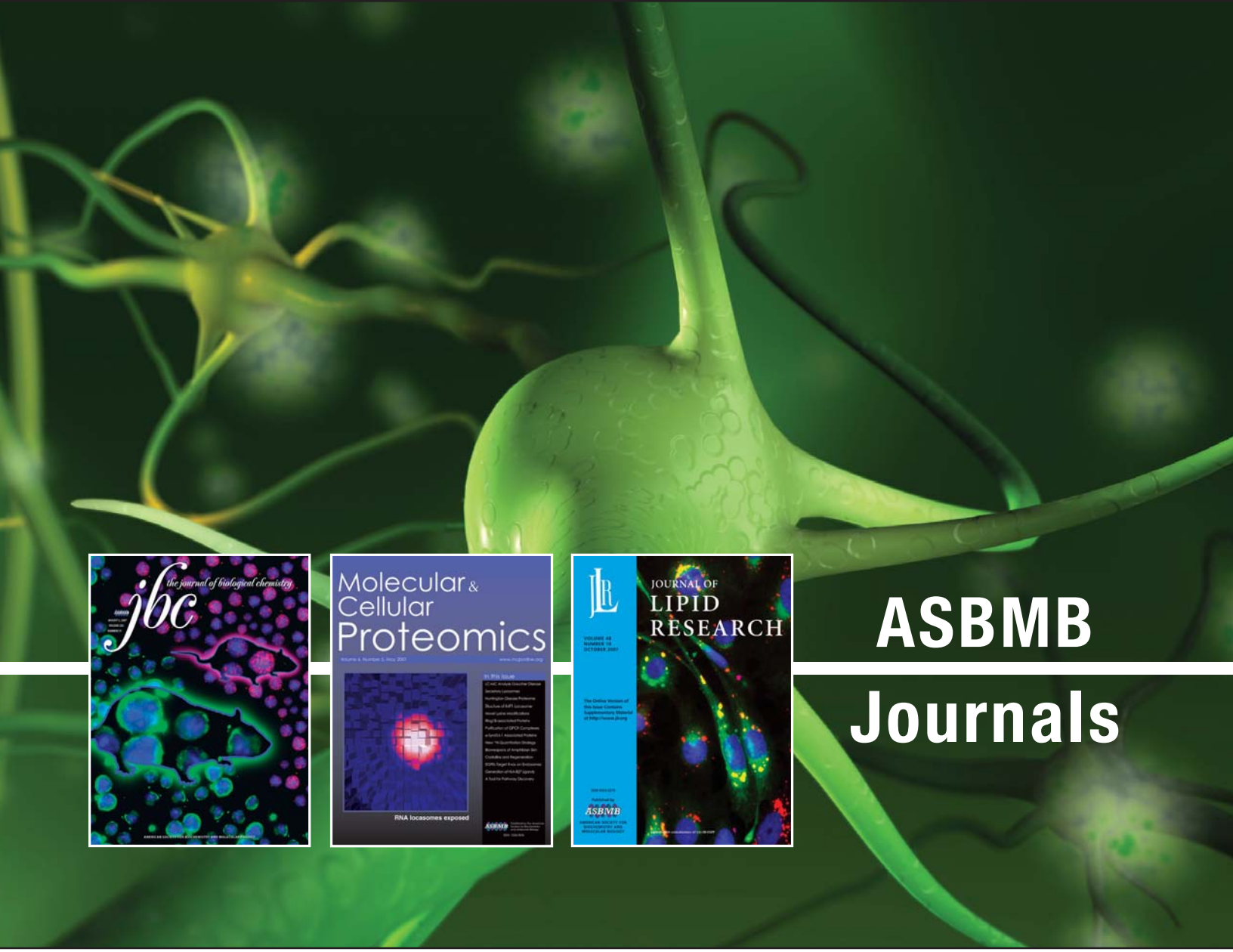
World Congress on the Insulin Resistance Syndrome
SEPTEMBER 25–27, 2008
LOS ANGELES, CA
www.insulinresistance.us

OCTOBER 2008

Translating Science into Health: Cytokines in Cancer and Infectious Diseases
OCTOBER 12–16, 2008
MONTREAL, CANADA
www.cytokines2008.org

Post Translational Modifications: Detection and Physiological Evaluation
OCTOBER 23–26, 2008
GRANLIBAKKEN, LAKE TAHOE
Organizers: Katalin F. Medzihradszky and Ralph A. Bradshaw, UCSF
www.asbmb.org/meetings

Transcriptional Regulation by Chromatin and RNA Polymerase II
OCTOBER 16–20, 2008
GRANLIBAKKEN, LAKE TAHOE
Organizer: Ali Shilatifard, Stowers Institute for Medical Research
Plenary Lecturer: Robert G. Roeder, The Rockefeller University
www.asbmb.org/meetings



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