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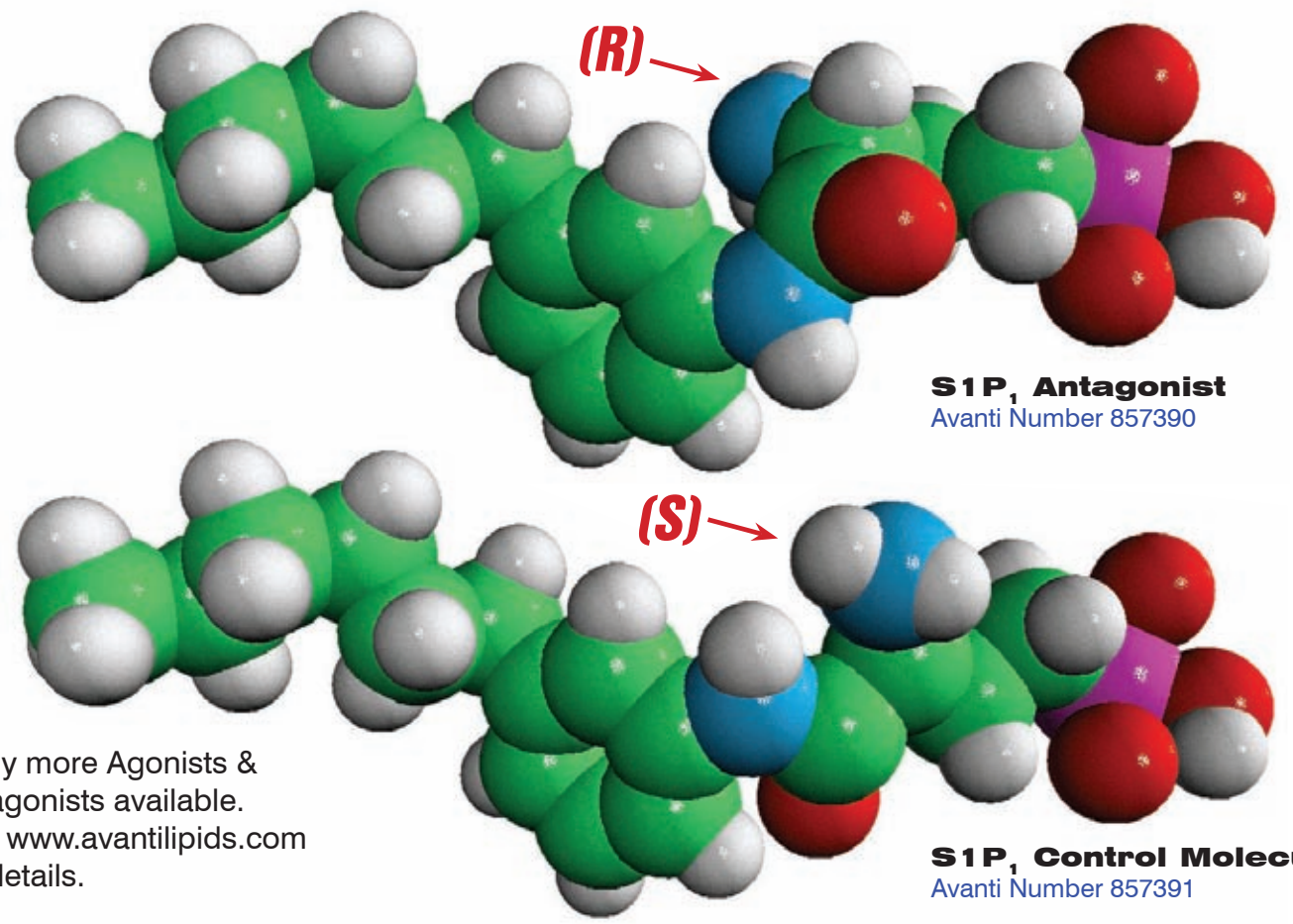

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M Germana Sanna, Sheng-Kai Wang, Pedro J Gonzalez-Cabrera, Anthony Don, David Marsolais, Melanie P Matheu, Sindy H Wei, Ian Parker, Euijung Jo, Wei-Chieh Cheng, Michael D Cahalan, Chi-Huey Wong & Hugh Rosen.

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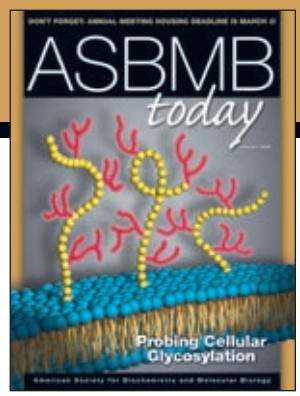

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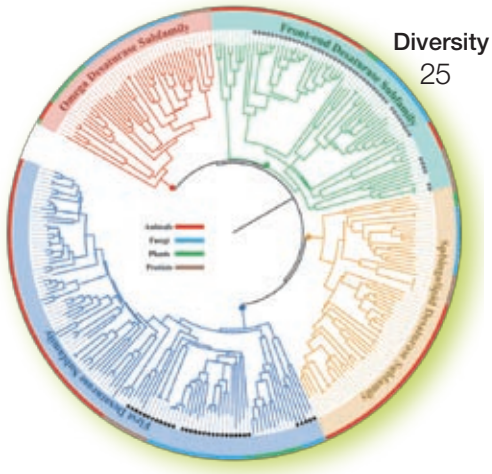

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podcast summary

February's ASBMB AudioPhiles Podcasts contain article highlights from *JBC*, *MCP* and *JLR*, including a look at several *JBC* minireviews and the classic work of Charles Tanford.

Download the podcasts at:
http://www.faseb.org/asbmb/media/media.asp

ASBMB today

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ASBMB Today

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from the editor

New Digital Features and a Look at Things to Come

Welcome to the February issue of *ASBMB Today*. I'd like to take this opportunity to highlight some of the projects we've been working on here at the magazine and at ASBMB.

During the month of January, we launched both the *JLR* News and *MCP* News podcasts. These podcasts provide overviews of articles that appeared in the January issues of the *Journal of Lipid Research* and *Molecular and Cellular Proteomics*, including those that appear in the BioBits section of this issue *ASBMB Today*. They can be accessed from the BioBits column in the digital version of *ASBMB Today* (which can be found at www.asbmbtoday-digital.com/asbmbtoday/current) as well as from the journal Web pages (www.jlr.org and www.mcponline.org) and the ASBMB Multimedia Web page (http://www.faseb.org/asbmb/media/media.asp).

In addition to these two podcasts, we posted three *JBC* News podcasts in January. These include a podcast containing overviews of articles that appeared in the *JBC* between December 7, 2007, and January 11, 2008; an interview with *JBC* Associate Editor Vincent Hascall, whose work is the subject of a *JBC* Classic that appeared in the December 28 issue of the *JBC*; and a podcast that looks at the alternative splicing miniseries published in the January 18 issue of the *JBC*. You can access the podcasts from the *JBC* website (www.jbc.org) and the ASBMB Multimedia Web page.

We plan on producing several *JBC, MCP* and *JLR* podcasts every month, so be sure to check the ASBMB Multimedia Web page regularly!

Coming in the March issue of *ASBMB Today* we'll be starting a new series about publishing in the *JBC*. This series will address issues such as using Office 2007 to submit materials to *JBC*; preparing tables, figures, and supplemental material; returning e-Proofs; and the new system for reprint and author page charges. We will also be soliciting article topics for this series so start thinking of questions you may have about publishing in ASBMB journals. You can also sign up for our workshop at the Annual Meeting, entitled "How to Publish in the Journal of Biological Chemistry." This lunchtime workshop, which will be led by several *JBC* Associate Editors, will be held from 12:30 to 2:30 p.m. on Sunday, April 6. Please register in advance for this event.

As always we appreciate your feedback, so feel free to write us at asbmbtoday@asbmb.org.

Erratum: In the January 2008 issue of *ASBMB Today*, an article on Sober Lectureship awardee S. Walter Englander mistakenly stated that he did a postdoctoral fellowship with Christian Anfinsen. Englander actually did postdoctoral fellowships with William F. Harrington, (in Anfinsen's section at the NIH) and Peter H. von Hippel (at Dartmouth Medical School).

letters to the editor

NIH Peer Review

To the Editor:

I applaud the hard work that ASBMB is investing in advising the National Institutes of Health (NIH) on how to improve the peer review system. A recent article in *Science* (2007, **318,** pp. 1708-1709) implies that some changes in peer review may be coming. However, even if the peer review process could be made flawless, this would only solve part of the larger problem associated with grant funding. The NIH, or an independent panel, needs to examine the mechanisms by which the highest scored grant proposals are selected for funding.

With funding so tight, the number of applications continues to increase. Those lucky few whose A2 applications score below the 10th percentile (maybe lower now) are probably grouped with a larger number of other A2 applications also scoring in the same range. Who decides which of these highly scored application(s) will be funded (*e.g.* can a 7th percentile grant be differentiated from a 10th percentile grant)? These decisions are made by institute program staff. These individuals are certainly well meaning and dedicated. However, they are not active bench scientists. Program staff does not participate in the scientific review of grants (this is strictly a task left to the review panel); they do not review papers for publication in professional journals; they are not funded to carry out research, and they do not publish peer-reviewed papers for the most part. Yet the future of our scientific enterprise lies entirely in the hands of program officials as they decide which grant application will receive funding. Is this the best we can do?

How are the funding decisions made by program staff? What are the most important selection criteria? The processes by which these decisions are made must be revealed so that they too can be subjected to the scrutiny of the scientific community. Are the selection processes consistent across institutes? Does program staff use scientific merit beyond the input of the scientific review panel? In many ways, the work of the scientific review panel is invalidated when program staff decides which among the very highest scored grants will be funded. As reviewers, we are exhorted to "spread the scores," but this becomes nearly impossible as scores become more compressed. Thus, peer review selects the best science, but the best science is not always funded. This is not a good situation, and changes in the peer review process will not change this.

The manner by which grants are selected for funding should be more transparent. Perhaps funding decisions need to be put into the hands of practicing scientists as part of a second level of review.

Donald M. Kuhn
Dept. of Psychiatry & Behavioral Neurosciences
Wayne State University School of Medicine and John D. Dingell Veterans Affairs Medical Center

To The Editor:

I am an emeritus member of ASBMB and I read Peter Farnham's article in the December 2007 issue, addressing the National Institutes of Health (NIH) peer review process.

In the same issue, I also read Heidi Hamm's article and am not surprised that she states, "Members of study sections generally think the system is working well…" and that, "As might be expected, the responses from applicants were somewhat more negative."

It's been a long time since I would have potentially applied for a grant from the NIH. While I am quite sure I never got an NIH grant, I am not sure I ever applied for an NIH grant. Nevertheless, I was made aware of the negatives in the NIH granting system that I think continue today.

One of the bullet points that you note is the suggestion that grant applications from new "principal investigators" be considered separately from those of more experienced principal investigators. Along those lines, I think that a specific percentage of the total available annual funds ought to be set aside for younger first time applicants.

As matters currently go, there are grantees who acquired academic positions, take up a field of investigation, and join the mutual back-scratching society of reviewers who examine applications allegedly for their quality but also with a view to protect their turf in a particular field. At times, such reviewers will note an

Tell Us What You Think We appreciate receiving letters that are suitable for publication regarding issues of importance or comment on articles appearing in *ASBMB Today*. Letters should be sent to the editor at the address found in the masthead. Letters must be signed and must contain the writer's addresss and telephone number. The editor reserves the right to edit all letters for clarity and length. Opinions expressed in letters do not necessarily reflect ASBMB policy.

applicant's suggestion and convince themselves that they had the idea all along. In this respect, the bullet point suggestion that Section Chairs should be senior scientists who no longer receive NIH funds is a step in the right direction. I would suggest that each study section include additionally one or two scientists in closely related fields but not in the precise field of a study section.

Too many scientists build their reputation on the work and ideas of others, obtained by NIH grant funds that deter some of the crop of scientists from pursuing their own ideas that might do more for humanity than those of the "Herr Professor." Shortly after World War II, the idea for funding scientific research through federal grants came from persons acquainted with the German "Herr Professor" system, and we have a considerable degree of that process alive and active in our universities and other scientific research institutions.

The institutions from which young applicants apply for NIH grants should be required to attest that they will provide reasonable laboratory and related facilities to the young applicant and will do so for at least the duration of the grant period. Furthermore, the institution should assure NIH that the young applicant will work on his own project, which would not bar consultations with other staff members or with outside sources.

Applications from young scientists should allow for a salary for such applicants if the request is made on the application, unless the applicants have a salary arrangement with the institution, as most assistant professors do.

Applications should be allowed for grant periods of up to 2-3 consecutive years. Maximum and minimum levels of support for such grants should be established annually, depending on NIH's annual budget; and a limit should be set for the number of such grants to applicants from a particular institution.

I hope these suggestions, which are based on about 20 years of academic research and teaching at universities and medical schools, will help to bring about a grant system that encourages young scientists to advance on their own and encourage new ideas and developments in the biochemical-medical field for the benefit of us all.

Edward Ronwin
Fort Collins, Colorado

To the Editor:

The well earned tributes to Arthur Kornberg by his former colleagues and associates should also include those of us in other areas of research to whom he extended his support, *e.g.* my early letter to Senator Knowland that served to ignite National Institutes of Health support of the university physical infrastructure on which research is integrally dependent. On the occasion of a personal visit in1976, he paid me a high honor by stating, "You sure stirred things up around here by having the insight and courage to bring into focus the need of governmental support of the crumbling physical infrastructure at our research universities."

There is, however, a need to correct the Retrospective paid to Dr. Kornberg by ASBMB that confers the honor of organizing the Department of Biochemistry at Stanford in 1959. This honor belongs to Nobel Laureate Edward Tatum and to the founder of *Annual Reviews*, Professor Murray Luck, who, under President Sterling, succeeded in establishing the new Department of Biochemistry in 1957 at which time they invited me to relocate from the University of Illinois Chicago Professional Colleges as the junior Assistant Professor. I attended the invitational lecture presented by Arthur on the occasion of his being considered to replace Ed Tatum upon Tatum's relocation to Rockefeller in 1959. It is my understanding that Arthur co-received the Nobel Prize with Severo Ochoa for work in Ochoa's laboratory at Washington University.

Laurence Pilgeram
Department of Molecular, Cellular and Developmental Biology
University of California, Santa Barbara

To the Editor:

In the interest of reducing paper and energy use, will *ASBMB Today* be converting to a digital-only format? Or can ASBMB survey members to inquire which members want only the digital version? Members who want only the digital version can be informed each time the digital version is published to remind them to read the publication. If enough members decline the hard copy version, the reduction in paper and energy usage could be substantial.

Dave Carrino
Department of Biology
Case Western Reserve University

RESPONSE:

We are definitely considering giving our readers the option of receiving only the digital version of the magazine. We plan on surveying members within the next few months to see how many would be willing to give up their print editions. If we receive a positive response, we will begin to offer the option for digital-only ASBMB Today. We will also continue to offer a printed copy of the magazine to those who want it.

New Ideas in Peer Review

BY HEIDI HAMM

Happy New Year! It is now 2008 and for my second column of the year I wanted to continue our discussion of the topic of peer review at the National Institutes of Health (NIH). As you recall, the agency is taking a year-long look at the peer review system from two directions. The Center for Scientific Review looked at all its study sections in a series of "open houses" held at NIH during 2007. In addition, the Advisory Committee to the NIH Director established a Working Group on Peer Review last spring, which has been seeking bold new ideas from the community in a series of "town meetings" around the country, including meetings in Chicago, New York, and San Francisco.

The Working Group, co-chaired by Lawrence Tabak (Director of the National Institute for Dental and Craniofacial Research) and Keith Yamamoto (University of California, San Francisco), released its initial set of "interim" ideas and themes at the Advisory Committee to the Director (ACD) meeting in Bethesda, Maryland, on December 7.

The Working Group received over 2,500 comments during the 6 months it devoted to gathering data and information, and came up with what it characterized as the four most significant challenges in making the peer review system more effective: 1) reaffirming and emphasizing the core values of review; 2) supporting new investigators; 3) reducing administrative burden; and 4) strengthening review leadership and the culture of review.

The Working Group received over 2,500 comments during the 6 months it devoted to gathering data and information

Reaffirming and emphasizing core values

Ten broad ideas were offered to address this challenge. These include establishing an "editorial board" model for peer review, in which there would be two levels of review: a mail review by external technical experts, followed by a study section assessment of the proposals together with the mail reviews.

In addition, the applicant would be allowed to submit a one-page "prebuttal" on a pre-meeting review form, if they felt a response was needed to clarify or address a mechanical or otherwise relatively trivial issue.

These steps would elevate the review discussion at the study section meeting to larger issues, and would allow the sections to maintain a chartered size but still benefit from narrow technical coverage. The prebuttal would give the applicant an opportunity to clarify and correct trivial problems (which sometimes become the sole focus of reviews, according to many applicants' comments).

A second key idea is to establish two R01 "tracks," innovative and transformative, and applicants could choose the track under which to submit their proposals. The *innovative track* would cover 99% of all proposals. This would be for grants that were new, original, inventive, pioneering, that advanced or shifted a paradigm, that were incremental, or evolutionary.

Innovative R01s would be project-focused, 5 years in duration, and applicants would submit a 7-10-page proposal. There would be an explicit focus on impact and innovation and not on preliminary results. There would also be an increased focus on the investigator. This would be reviewed under the study section system.

However, the remaining 1% of grant applications would be under the *transformative track,* and these would be grants considered revolutionary, disruptive, creating new fields, or synthesizing new paradigms.

Transformative applications would be focused on the investigator, rather than on the project's potential for impact and innovation. The application would con-

sist of a 3-5-page essay, and the award would be for 10 years. There would be few reporting requirements. The essay would explicitly focus on revolutionary concepts and approaches and would include evidence that the investigator is an explorer and discoverer. It would not be subject to panel-based review; rather, the candidates would be ranked, independently, by email, and the finalists would then be interviewed.

Regarding triage and prioritization, the single criterion for most grant applications would be impact. No amendments would be permitted. In addition, a new ranking system would be established under which each reviewer would rank only the top 10 applications being reviewed. This would replace the current system of priority scoring.

The Working Group is going to be refining its proposals over the next few months, and pilot programs will be launched to implement some of the ideas to see how they work in practice.

Support for new investigators

NIH is very mindful of the difficulties new investigators face, and several ideas were offered as possible solutions to these problems. Applications could be shortened and emphasize ideas and impact; there could be an increased emphasis on the quality of the PI; new applications could be funded at a higher rate; there could be a separate review by "generalists," as fellowship applications are reviewed now; and finally, there could be an increased value associated with team science—a change of pace from the current system that focuses more on the independence of the individual.

Reducing administrative burden

This was viewed as a major problem in the comments received; and many ideas were offered to improve the situation. In addition to many of the ideas offered earlier, there could be an option for accomplishment-based renewal; eliminating the mentoring function from merit review; reducing the number of award mechanisms; and requiring a minimum percent of PI effort per grant, something in the range of 25%.

Strengthening review leadership and culture of review

A major problem study sections face is recruiting qualified senior members of the community to serve, many of whom say they are too busy or otherwise unavailable. Among the ideas offered to deal with these issues were reaffirming and emphasizing the core value of a good review; reducing the administrative burden associated with serving on a study section; providing explicit training (and possibly grading) of study section chairs and members; providing incentives for service and requiring participation if invited; and increasing flexibility for attendance as well as the size of the grant load for individual members.

The Working Group is going to be refining its proposals over the next few months, and pilot programs will be launched to implement some of the ideas to see how they work in practice.

NIH indicates that it takes these proposals seriously; in fact, in early January it announced in the *NIH Guide to Grants and Contracts* that it has taken an initial step to make study section service more palatable by allowing those serving on study section to submit grant applications at any time during the year, rather than at the set dates most applicants are required to meet. This addresses the concern many have expressed that submitting one's own grant applications on time is sometimes difficult or impossible if serving on a section because section service is very time-consuming if done properly.

Want to learn more? Come to EB in April

A session on peer review will be held at the upcoming Experimental Biology meeting in San Diego in April. At least one of the co-chairs of the Working Group will be attending to discuss the Working Group's recommendations. "*Peer Review at NIH: Making Sure the System Works*" will be held on Sunday, April 6, from 11:30 a.m. to 1:00 p.m. in Room 16A at the Convention Center. If you are interested in learning more about the Working Group's deliberations, this would be a good session to attend.

Science & Security: Deemed Export Committee Releases Report

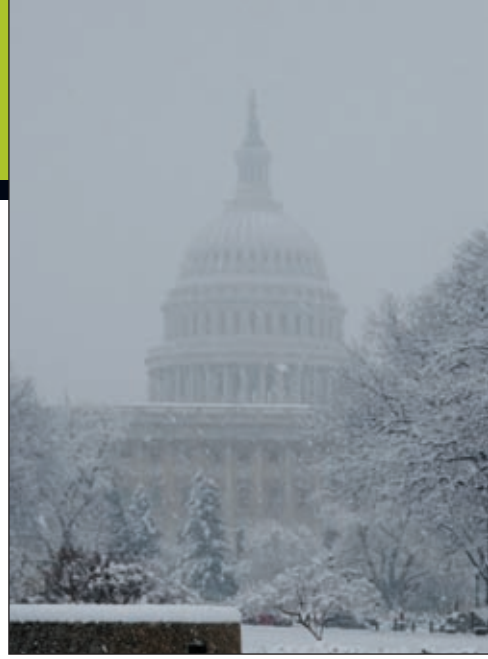
BY CARRIE D. WOLINETZ

The Deemed Export Advisory Committee (DEAC) has released its final report and recommendations, and it appears they have adopted many of the comments issued by Federation of American Societies for Experimental Biology (FASEB) and the research community. "Deemed exports" arose as an issue nearly 2 years ago when the Inspector General (IG) at the Department of Commerce proposed regulations to control knowledge related to use of export-controlled technology. The proposal would have placed an enormous burden on research universities, which would have been obligated to obtain export control licenses for many foreign nationals working in the labs. The IG report concluded that "technology relating to controlled equipment–regardless of how that use is defined–is subject to the deemed export provisions (and the requirement to license foreign nationals having access to that equipment) even if research conducted with that equipment is fundamental." This means that, for example, a basic scientist working with a foreign student or postdoc would have to apply for an export control license before even explaining research that might involve a controlled piece of technology. This could easily mean foreign nationals would have been forbidden from even entering many university labs without a license.

FASEB joined with our colleagues in the research community to object to the stringent proposal, and the outcry ultimately resulted in the withdrawal of the proposal and appointment of the DEAC to examine the issue. (To read FASEB statements on the proposed deemed export rules, please visit: http://opa.faseb.org/pages/PolicyIssues/homelandsecurity_pi.htm.) The DEAC held a series of regional meetings throughout the country, seeking input from a variety of stakeholders, ranging from the business community to security experts to the academic research community. FASEB testified at one of the meetings at the Massachusetts Institute of Technology in Boston, reiterating the critical importance of fundamental research at our nation's universities, as well as the cardinal role of collaboration with foreign scientists in the research enterprise.

The DEAC report and recommendations, titled "The Deemed Export Rule in an Era of Globalization," were released on December 20th, 2007, and were quite critical of both the existing system for controlling deemed exports and the proposed changes. The commission stated, "In the present environment, most scientific and technologic knowledge and items will not be denied to enemies even by a perfect United States control regime: They will simply be obtained from others.î As FASEB and others had suggested, the DEAC recommended that the fundamental research exemption be preserved because of its "use in allowing America's research community to continue to help drive our national economic and security competitiveness." In fact, the DEAC recommended a complete overhaul of the deemed export control system, with a philosophy of building very high fences around the most sensitive of dual-use technologies and allowing other security measures, such as the visa processing system, to handle foreign nationals' access to more prevalent technologies. Part of this recommendation would require a much more comprehensive screening of foreign scientists working with export-controlled technologies, including examining country of birth, previous foreign residences, and past and current affiliations and activities. However, if the system outlined by the DEAC were adopted, such stringent security checks would only apply to those applying for a license to work with technologies with obvious military applications or security implications. The report has been submitted to the Secretary of Commerce who has stated he intends "to carefully review the Committee's findings as we move forward to strike the right balance of protecting national security while continuing to attract the world's best and brightest." It remains to be seen how or if the recommendations will be translated into policy changes.

Carrie D. Wolinetz is Director of Scientific Affairs and Public Relations for the Office of Public Affairs at the Federation of American Societies for Experimental Biology (FASEB). Outside of FASEB, Wolinetz is an adjunct assistant professor at Georgetown University, in the School of Foreign Service's program on Science, Technology & International Affairs, as well as serving as President of the Bethesda chapter of the Association for Women in Science. She can be reached at cwolinetz@faseb.org.



ASBMB and Coalitions for Biomedical Research

BY PETER FARNHAM

ASBMB has been involved in public affairs in its own right since 1985. These public affairs efforts are overseen by the ASBMB Public Affairs Officer and the Public Affairs Advisory Committee, which monitors and deals with all matters political, social, and philosophical that relate to the government's role in the practice of modern science. As part of the Society's effort to advocate for funding of basic research and education, ASBMB has become involved in numerous coalitions in Washington, D.C. What follows is a description of all of the coalitions in which ASBMB plays a part.

FASEB

FASEB was founded in 1912 as a coalition of three professional societies, and ASBMB is one of its charter members. FASEB began to get more involved in public policy in the mid-1980s with the establishment of a greatly expanded Office of Public Affairs (OPA). The current Director of the Office of Public Affairs is Dr. Howard Garrison, who took over that role in 1996.

ASBMB played a major role in FASEB's restructuring in the early 1990s. Howard Schachman, then FASEB's president, organized the "Williamsburg retreat," during which FASEB was reorganized and the dues structure changed. FASEB also expanded dramatically during the 1990s; it is now made up of 22 societies.

ASBMB staff has worked directly with Dr. Garrison and his staff on a variety of projects over the years. For example, ASBMB is one of only two or three FASEB societies with a strong interest in the National Science Foundation (NSF). Thus, the ASBMB public affairs staff has assisted the OPA on NSF-related issues.

Campaign for Medical Research (CMR)

CMR was established in the mid-1990s by philanthropist John Whitehead to advocate for the doubling of the NIH budget. CMR staff arranged hundreds of visits to the Hill during the doubling years and was one of the key organizations in bringing about this needed increase at NIH. ASBMB initially participated in CMR through FASEB's membership but joined CMR in its own right approximately 6 years ago. CMR benefits enormously from the active participation of several former Members of Congress, including John Porter, Paul Rogers, and Bob Michel.

Bridging the Sciences

ASBMB joined this organization, the brainchild of the Biophysical Society, in 2003. It was set up to promote interdisciplinary research that "bridged" both the life and physical sciences. The group hired John Porter as its lobbyist and has a number of accomplishments to its credit: many Bridging the Sciences Programs have been included in legislation for the NSF and the National Institutes of Health (NIH). In addition, the coalition has been working with staff at the National Institute of General Medical Sciences on designing a mechanism to replace the R21 high risk grants. The coalition is also involved in advocating for a mechanism to fund research at the interface of the life and physical, mathematical, and computational sciences.

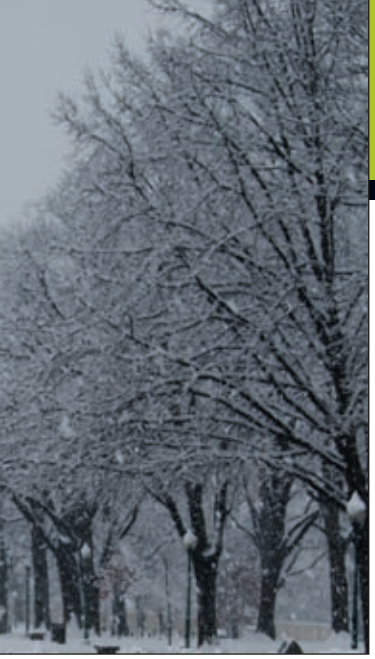
Research!America

ASBMB has been a member of Research!America almost since its founding in 1989. Its long time president is Mary Woolley. Research!America bills itself as "the nation's largest not-for-profit public education and advocacy alliance working to make research to improve health a higher national priority." It has more than 500 member organizations that represent the voices of more than 125 million Americans. It produces public opinion polls, advocacy programs, and publications to help advance medical and health research.

Its members are "stakeholders in basic, behavioral, biotech, clinical, health services, prevention and public health, and therapeutic research from both the public and private sectors." Research!America tries to advocate for "strong, increased investment in the National Institutes of Health and Centers for Disease Control and Prevention."

Research!America's goals are to:

- **Achieve funding for medical and health research from the public and private sectors at a level warranted by scientific opportunity and supported by public opinion;**



- **Better inform the public of the benefits of medical and health research and the institutions that perform research;**
- **Motivate the public to actively support medical and health research and the complementary sciences that make advances possible;**
- **Promote and empower a more active public and political life by individual members of the research community on behalf of medical and health research, public health, and science overall.**

Ad Hoc Group for Medical Research Funding

This loose coalition was established in the 1980s to unify the very diverse NIH advocacy community. At the time, most organizations were advocating for specific NIH institutes without any thought to what anyone else was advocating. In response to complaints from the Hill, the Association of American Medical Colleges formed this coalition, and its main purpose is to develop a common advocacy figure for NIH that the whole biomedical advocacy community rallies around each fall in preparation for the coming appropriations cycle.

ASBMB has participated as a member of the Ad Hoc Group for many years, and FASEB is also active in the organization.

Although an annual funding recommendation is the ad hoc group's main activity, it has expanded its portfolio in recent years. For example, it convened a series of meetings in 2005 and 2006 with staff members working for Rep. Joe Barton (R-TX), former chair of the House Energy & Commerce Committee, on his draft NIH Reauthorization bill. It has also assisted Rep. Mike Castle (R-DE) in his efforts to get a stem cell bill passed in the House.

Council of Scientific Society Presidents

This organization was founded in 1973 by a former American Chemical Society (ACS) president. It is an organization made up of the presidents of approximately 60 scientific societies. ASBMB was once a member of this organization, left in the late 1980s, and rejoined approximately 2 years ago at the behest of our then president, Judith Bond.

The group meets twice a year. Its goals are to:

- **Develop an enduring network of past and present national leadership in science;**
- **Provide communication and collaboration among the various scientific disciplines through the presidents of scientific societies;**
- **Deliberate and adopt public policy positions and act upon science research and education issues of national or international scope;**
- **Perpetually enhance leadership skills development in the science community;**
- **Develop ways to enhance the public's understanding and appreciation of science;**
- **Foster scientific research, science study, and dissemination of discoveries;**
- **Improve the free flow of scientific information.**

Coalition for National Science Funding

The Coalition for National Science Funding (CNSF) advocates for the National Science Foundation. It was also founded in the 1980s and is modeled on the Ad Hoc Group for Medical Research Funding. The CNSF has approximately 85 members and produces an annual funding recommendation for the NSF that is widely adopted within the scientific community. The executive director of the group is Dr. Sam Rankin, the top Washington operative of the American Mathematical Society.

As you can see, ASBMB has many partners in a variety of coalitions covering a wide range of science policy and advocacy efforts. We continually assess the value of each coalition with which we are affiliated, and always try to keep in mind the ultimate test of whether a coalition is worth joining or not—will it advance ASBMB's agenda of serving our members' interests?

Peter Farnham CAE is public affairs officer of the Society, a position he has held since 1985. He can be reached at pfarnham@asbmb.org.

Are You an Elected Public Official?

Do you hold elective office, such as on a city or town council, a school board, a judgeship, or some other elected office?

If so we want to hear from you.

If you currently hold such an office, have run for one but did not get elected, or have even considered running, please let us at ASBMB know. We are most interested in hearing about your experiences and would like to talk with you about them.

Please contact ASBMB's public affairs officer, Pete Farnham, at pfarnham@asbmb.org.

Evolution Watch

What follows is a brief roundup of several items about the ongoing battle on teaching evolution in biology classes in certain school districts around the country.

Texas Forces Resignation of Science Administrator

A science administrator in the Texas State school system was forced to resign late in 2007 because she forwarded information about a lecture critical of intelligent design to colleagues in her office. The reason for the forced resignation was that her superiors stated that intelligent design and evolution were subjects about which they were required to remain "neutral" and her circulation of the flyer about the lecture was taken as not adhering to that position.

A wide range of scientific societies have written to appropriate officials in Texas decrying the firing, including FASEB. The letter is posted on the ASBMB website. ASBMB is also preparing its own letter. For more details about the flap, please visit the website of the National Center for Science Education at www.ncseweb.org

NAS Releases Updated Evolution Booklet

On January 3, 2008, the National Academy of Sciences (NAS) and Institute of Medicine (IOM) released *Science, Evolution, and Creationism*, a book designed to give the public a comprehensive and up-to-date picture of the current scientific understanding of evolution and its importance in the science classroom. Recent advances in science and medicine, along with an abundance of observations and experiments over the past 150 years, have reinforced evolution's role as the central organizing principle of modern biology, said the committee that wrote the book.

"*Science, Evolution, and Creationism* provides the public with coherent explanations and concrete examples of the science of evolution," said NAS President Ralph Cicerone. "The study of evolution remains one of the most active, robust, and useful fields in science."

"Understanding evolution is essential to identifying and treating disease," said Harvey Fineberg, president of IOM. "For example, the SARS virus evolved from an ancestor virus that was discovered by DNA sequencing. Learning about SARS' genetic similarities and mutations has helped scientists understand how the virus evolved. This kind of knowledge can help us anticipate and contain infections that emerge in the future."

To get a copy of the publication, please contact the National Academy Press or visit its website at www.nap.edu.

Young Earth Creationist Journal Started

For those of you interested in submitting papers to a creationist journal, the creationist group "Answers in Genesis" has just the ticket: according to a recent press release, it is "excited to announce the launch of its on-line technical journal called *Answers Research Journal* (*ARJ*)." Hosted at www.answersresearchjournal.org (but linked to Answers in Genesis's (AIG) website), this will be a professional peer-reviewed technical journal for the publication of interdisciplinary scientific research and other relevant research from the perspective of the recent Creation and the global Flood within a biblical framework. The term "peer review" is not defined in the AiG press release, although perhaps the author's guidelines describe the process.

In case you are not familiar with the various gradations of the creationist movement, young earth creationists are those who believe that the Earth and all life on it were created approximately 6,000 years ago, that dinosaurs lived contemporaneously with humans, but that dinosaurs drowned in the Biblical flood. We'll keep you posted on the development of this important addition to the literature on life's origins and development.

Please visit www.answersingenesis.org for more information.

2009 Budget to Be Released February 4

Be sure to look in next month's issue of *ASBMB Today* for full coverage of the President's 2009 science budget, focusing on research at NIH, NSF, the Department of Veterans Affairs, and other agencies that fund a lot of life sciences research. Although we are not optimistic that the upcoming year's proposals will be any better than last year's, we hope that we can positively impact congressional action on the proposals with the help of all of you writing letters and sending e-mails to your representatives. So, please get ready for occasional notes from ASBMB asking you to write or call Congress. We will surely need your assistance if we are to have any kind of impact.

Retrospective: **Earl R. Stadtman** (1919–2008)

Earl Reece Stadtman, former ASBMB president, passed away on January 6, 2008. He was a longtime scientist at the National Institutes of Health (NIH) and is considered one of the great biochemists of the 20th century.

Stadtman was born in 1919 in Carrizozo, New Mexico. He earned his B.S. from the University of California, Berkeley (1942), and remained there for graduate work with Horace A. Barker. He and Barker used enzyme extracts from Clostridium kluyveri to study the individual reactions involved in fatty acid synthesis and confirmed that ethanol is oxidized to acetyl phosphate that condenses with acetate and forms butyric acid. Stadtman earned his Ph.D. in 1949 and joined Fritz Lipmann at Massachusetts General Hospital for postdoctoral work. There he showed that acetyl-CoA was the source of active acetate in the synthesis of butyric acid from acetyl phosphate.

In 1950, Stadtman and his wife Thressa, also a biochemist, joined the NIH, where they remained for the rest of their careers. They developed a unique way of conducting research and training scientists, often called the "Stadtman way." This refers not only to the extraordinarily high standard of rigor they set in biochemical research but also to their generous sharing of credit in publications with more junior scientists.

At the NIH, Earl Stadtman continued his research on fatty acid metabolism and successfully carried out the first in vitro net synthesis of acetyl-CoA. He also demonstrated that long-chain fatty acid synthesis is catalyzed by an enzyme complex in which methylmalonyl-CoA is the source of active acetate. Stadtman also spent a good deal of time working on glutamine synthetase and discovered that the end product inhibition of the enzyme was cumulative and that susceptibility to feedback inhibition only occurred when glutamine synthetase was adenylated by adenylyltransferase. He eventually surmised that glutamine synthetase activity was controlled by a cascade system in which two systems of reversible covalent modification were tightly linked. This cascade system allowed enzyme activity to be gradually shifted in response to metabolite availability.

We extend our sympathy and thoughts to Stadtman's friends and family. Below, as a tribute, we offer thoughts and reflections from several of Stadtman's friends and former colleagues.

Earl Stadtman could look at results from the laboratory and see in them descriptions of the nature of biology which the rest of us failed to see. Where most of us saw the ordinary, he deduced the extraordinary. Earl also taught us the importance of unyielding rigor in assessing our experimental investigations. And he taught us the value of persistence and of plain old-fashioned hard work. On this latter point, he once commented to me, "Progress in science is directly proportional to the number of experiments you do."

— Rodney L. Levine, *Senior Investigator and Chief of the Section on Protein Function in Disease, NHLBI, National Institutes of Health*

Earl has been described as a "biochemist's biochemist," a tribute to the meticulousness of his research. His data were precise: "If you need statistics to analyze your data, you should re-do the experiments" is a reasonably accurate quote. For one whose impact on biochemistry has been so great for so many years, his publications may seem relatively few in number. In large part, this is due to Earl's frequent practice of not putting his name on papers when it would have been fully justified to do so, thus fostering the careers of many outstanding postdoctoral fellows who trained in his laboratory. Though I never worked with Earl, he was always a role model and a supportive colleague, working in neighboring laboratories, sharing space and equipment, for 55 years. A biochemist's biochemist, yes, and the prototype of an NIH scientist.

— **Edward D. Korn,** *Chief of the Laboratory of Cell Biology and Director of the Cell Biology and Physiology Center, NHLBI, National Institutes of Health*

I was a postdoctoral fellow in Earl Stadtman's laboratory from 1969 to 1971, an experience that transformed my life. As a young physician fresh from an internal medicine residency, I had not been exposed previously to intense research. In Earl's lab I experienced a combination of devotion, intensity, and integrity that far exceeded any of my prior experiences. Uniquely, Earl could be passionate and impassionate at the same time. He was passionate for science, and yet he examined every experiment impassionately and with the highest level of criticism. As a fellow in Earl's lab, if you made a novel discovery, his attitude was not the usual "let's see how we can prove that your discovery is true." Quite the opposite. Earl's attitude was "let's think of every possible way to disprove your hypothesis. Only then will I begin to accept it." I believe that Earl's example explains why so many of his students achieved distinction in science over the ensuing years. Earl was a leader in a generation of scientists who made biochemistry into a discipline. He will be sorely missed.

— **Michael S. Brown,** *Nobel Laureate and Regental Professor of Molecular Genetics, University of Texas Southwestern Medical School*

I was a graduate student, NHLBI Staff fellow, and Arthritis Investigator in Earl's laboratory. I am both honored and privileged to know him and work with him for many years. He created an environment of scientific inquiry that is unique and, in my view, unmatched anywhere. He was a creative thinker - able to extract clarity from complex data sets. Although he was thoroughly intrigued by enigmatic results, he loved simple, elegant experiments. Earl had great scientific intuition and he examined every experiment with rigor, interrogating the data, evaluating the potential limitations of the methods, questioning the assumptions, and challenging the controls. And although Earl often had a healthy skepticism for new ideas, he was able to embrace change. He was a truly remarkable man – a wonderful teacher, mentor, and friend.

— **Cindy Oliver,** *Vice President, Process Biochemistry and Formulation Sciences, MedImmune*

A few days after my arrival in Berkeley in the fall of 1948, a friend invited me to meet this terrific young biochemist, Earl Stadtman. Thus our meeting on the steps of the Life Science Building was the beginning of a friendship that led to my spending most of a sabbatical year as a Fogarty Scholar in Earl's department at NIH where I worked with Ann Ginsburg. It was a glorious year with a great group of biochemists that Earl had assembled, and we had an exciting time extolling the virtues and mysteries of both glutamine synthetase, Earl's favorite, and aspartate transcarbamylase, with which I have had a long time love affair. Earl and his colleagues not only were doing sensational research but Earl was a magnet in attracting to his laboratory talented physicians. As newly minted biochemists, they in turn made enormous contributions to science thereby demonstrating NIH's preeminent role in training as well as in research.

— **Howard K. Schachman,** *Professor of the Graduate School, Department of Molecular and Cell Biology, University of California, Berkeley*

I have known Earl Stadtman for over 50 years both as a close friend and as a colleague. His presence at NIH over the years has been most important, both in his beautiful biochemical studies but also in his personal interactions with so many of us. Many of his trainees went on to be important leaders in research at NIH and in universities and industry. His solid, thoughtful, imaginative, and thorough approach to a variety of biochemical problems created an important atmosphere, and I feel that his influence was critical in the development of NIH as an important scientific institution over the past 50 years.

— **Herbert Tabor,** JBC *Editor and Chief of the Pharmacology Section at the Laboratory of Biochemistry and Genetics, NIDDK, National Institutes of Health*

I was one of Earl's first M.D. post-docs. He taught me biochemistry and enzymology first hand by allowing me to work with him at the bench. I owe my entire career to Earl since my knowledge of biochemistry was the expertise that I brought to every position I held. Earl was a great teacher, generous with his time and ideas, and totally dedicated and loyal to the people that he took into his laboratory. He will be missed by all those who went through his laboratory, the scientists now at NIH, and all the scientists he has influenced through his work over his long career.

— **Roy Vagelos,** *retired Chairman and CEO, Merck and Co., Inc.*

As President of ASBMB, Earl had strong views but was always willing to listen to my ideas and suggestions and those of the Council. He was a gentleman and was gracious in all my interactions with him. This was deeply appreciated. His interests and scholarship were wide ranging and are reflected in the many awards he received. He will be missed personally and professionally by those who were fortunate to know him.

— **Charles Hancock,** *former ASBMB Executive Director*

Although I never worked directly with Earl, he has been a friend and colleague for many years. Whenever I would visit NIH, whether for Study Section, as part of the External Review Board for NIHLB, or for GM Council, I would try to stop by to see Earl. Often he would invite me to give a talk, and I always felt as though his little corner of the NIH campus was a special home for me. He was one of the giants of biochemistry for so many decades and always had new thoughts and insights into biological problems. His most recent work on reactive oxygen species obviously had captured his imagination, and this was the topic of our last conversation. I always learned something new after talking with Earl. Although he was a man of few words, it behooved one to listen closely to those words! I always thought of Earl as one of my "guardian angels" and for some reason always felt that he watched out for me. He not only appreciated my science, but also appreciated that I was a mentor for other women. He once put his arm around me and said "Susan, you are really special," and those are words that I have treasured always. I shall miss him greatly.

— Susan S. Taylor, *Howard Hughes Medical Institute Investigator and Professor of Chemistry and Biochemistry, University of California, San Diego*

I joined Earl's laboratory as a Visiting Scientist after my postdoctoral training. Working with Earl on the bench at NIH was stimulating and fun. He taught me biochemistry, along with the importance of being persistent and rigorous in science and never shortchanging any required experiment. He believed in the adage "nothing ventured, nothing gained," and passionately carried out additional experiments to rule out any alternative explanations. He was a role model for young scientists. He was dedicated to science, brilliant in analyzing scientific problems, yet humble and considerate of others. I found him among the nicest people I have met. With his personality, it is not surprising that everyone who went through his lab considered themselves as a member of his family. Earl's accomplishments as a scientist, a scientific statesman, a teacher, and a considerate human being are not easily matched.

— P. Boon Chock, *Director of the Biochemistry and Biophysics Center and Chief of the Laboratory of Biochemistry, NHLBI, National Institutes of Health*

FOOTNOTE:

More information on Stadtman's research can be found in his *JBC Classics* article (Kresge, N., Simoni, R. D., and Hill, R. L. (2005) *J. Biol. Chem.* **280** (26)) and Reflection (Stadtman, E. R. *J. Biol. Chem.* **276**, 44357-44364) and in an on-line NIH exhibit at http://history.nih.gov/exhibits/stadtman/index.htm.

asbmb member spotlight

President Honors Arratia

Juan F. Arratia, director and principal investigator for the Model Institutions for Excellence project at Universidad Metropolitana (Puerto Rico), has received the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. The winners of the 2006 competition, consisting of 10 individuals and 1 organization and representing a number of scientific disciplines, were announced at the White House this past November. The awards are given to individuals who have demonstrated outstanding and sustained mentoring and guidance to a significant number of under-represented students at the K-12, undergraduate, or graduate education level; or organizations that, through their programming, have enabled a substantial number of students who are traditionally under-represented in the STEM fields to pursue and complete relevant degree programs.

At Universidad Metropolitana, Arratia has recruited unprecedented numbers of Hispanic students into STEM fields; increased the retention of STEM majors from the freshman to sophomore year; and given these students comprehensive career advice. He has also helped more than 500 undergraduate Hispanic STEM students and more than 1800 pre-college Hispanic students by providing them with summer research experiences in the United States and abroad.

PHOTO: RODNEY CHOICE AND CHOICE PHOTOGRAPHY.

Holick Receives Eli Lilly Award

Michael F. Holick was recently awarded the 2007 Eli Lilly Lecturer Award from the Canadian Society of Endocrinology and Metabolism. Holick, an internationally recognized expert in vitamin D and skin research, received the award for decades of pioneering work that elucidated the important role vitamin D plays in a wide variety of chronic health conditions.

Holick is a professor of medicine, physiology, and biophysics and director of the General Clinical Research Center at Boston University School of Medicine and Director of the Bone Healthcare Clinic at Boston Medical Center. Since assuming this position, he has initiated numerous clinical research programs. His psoriasis work with active vitamin D is considered to be on the forefront of research into this complex disease. The results of these programs have led to significant contributions in the basic science of vitamin D and more recently into a clearer understanding of the calciotropic hormone, PTHrP, and its uses. This has translated into new therapies for a wide diversity of diseases from psoriasis and hair loss to osteoporosis.

Diamandis Awarded Frey–Werle Medal

Eleftherios P. Diamandis, professor and head of clinical biochemistry at the University of Toronto and division head of clinical biochemistry at Mount Sinai Hospital and University Health Network/Toronto Medical Laboratories, Ontario Canada, has been awarded the E. K. Frey-E. Werle Commemorative Gold Medal for his outstanding research on the human tissue kallikreins.

The award was presented to Diamandis by Hans Fritz, Governor of the Frey-Werle Foundation, at the 5th General Meeting of the International Proteolysis Society in Patras, Greece, this past October.

Diamandis' work has focused on the identification and characterization of kallikrein serine proteases and kallikrein-related peptidases KLK of hK and cancer diagnosis. He has made fundamental contributions on the role of these proteases in normal and pathological states, and in the area of cancer biomarkers for early diagnosis and monitoring of therapeutic effectiveness. He has published more that 400 original papers, holds 13 patents, co-authored a recent textbook on Tumor Markers, and serves on the boards of 25 journals. He has received several other awards for his work, including the 2007 Morton K. Schwartz Award for Significant Contributions in Cancer Research Diagnostics from the American Association for Clinical Chemistry.

Ehlers Wins Young Investigator Award

Michael Ehlers, associate professor of Neurobiology and Wakeman Scholar in the Department of Neurobiology at Duke University, Durham, North Carolina, and Howard Hughes Medical Institute investigator, has received the Young Investigator Award from The Society for Neuroscience. The award, which is given to young scientists with outstanding achievements, was presented to Ehlers along with Ricardo Dolmetsch of Stanford Medical School at the Society's 37th Annual Meeting in San Diego this past November.

Ehlers received his B.S. degree in chemistry at the California Institute of Technology before pursuing graduate and medical studies in neuroscience at The Johns Hopkins University. His research focuses on brain plasticity and protein trafficking and turnover in dendrites. Ehlers has shown that neurons regulate electrical activity in different ways. Recently, he has shown how internal cell structures called recycling endosomes trigger a prolonged burst in neuron s electrical activity by causing a surge in α-amino-3-hydroxy-5-methylisoxazole-4-propionic acid receptors.

Mestecky Wins Czech Mind Prize

Jiri Mestecky, a University of Alabama at Birmingham professor of microbiology and medicine, has been awarded the 2007 Czech Mind prize. The annual award is the highest scientific honor in the Czech Republic, and recipients often include Czech nationals working in other countries.

Mestecky's research focuses on the microbial environment of the gut, mouth, and mucosal membranes. His expertise in mucosal immunology has earned him world acclaim, and in recent years he has become a prominent researcher into a new class of experimental human immunodeficiency virus vaccines.

In addition to Mestecky's prize, six other Czech Mind awards were given out this year. The award jury is made up of scientists, governmental officials, and corporate leaders throughout the Czech Republic and Europe. The prize organizer is the Prague-based firm of Ceska Hlava S.R.O., which manages that nation's science and technology outreach programs in schools and on Czech language television. Each Czech Mind award comes with a monetary prize that is funded through donations and non-governmental sponsors.

IN MEMORIAM

Simon Black

Simon Black died of heart failure in Bethesda, Maryland, on January 5, 2008. He was a biochemist for over 40 years at the National Institutes of Health (NIH) and served on the *Journal of Biological Chemistry's* Editorial Board.

Black was born in Deerfield, Wisconsin, in 1917. After receiving a Ph.D. in biochemistry in 1940 from the University of Wisconsin, he moved to Chicago, where he conducted weapons research for the Army during World War II. From 1946 to 1951, Black performed research at the Department of Medicine, University of Chicago, and discovered a method for isolating aldehyde dehydrogenase. After spending a year at Massachusetts General Hospital in Boston, Black began his tenure at NIH in 1952. At NIH, he described the biosynthesis of threonine and the reduction of methionine sulfoxide, and he proposed a theory on the origin of life. In the 1970s he was a member of the Committee on Space Research (COSPAR), an international organization of scientists in space-related disciplines, and traveled to Europe, South America, and Asia. He retired from NIH in 1993.

IN MEMORIAM

Howard J. Saz

Howard J. Saz passed away on December 14, 2007. He was Professor of Biochemistry at the University of Notre Dame for 33 years, until his retirement in 2002.

Born in New York, Saz received his Bachelor of Science degree in Chemistry from City College of New York and his Ph.D. from Western Reserve University (1952). In 1953 he became a Fellow of the National Foundation for Infantile Paralysis, and spent that year at the University of Sheffield, United Kingdom, working with Hans Krebs. Upon returning to the United States, he joined the faculty at Louisiana State University School of Medicine. In 1960 he became a faculty member of the Department of Pathobiology at The Johns Hopkins University, leaving in 1969 to join the faculty of Notre Dame University.

Saz was the first recipient of the American Society of Parasitologists Bueding-Von Brand Memorial Award, in recognition of meritorious contributions to the study of the biochemistry and pharmacology of helminths. He served on numerous panels for the National Institutes of Health, The National Science Foundation, and the World Health Organization.

Saz leaves a legacy of dedicated, well trained scientists who are committed to carrying on his philosophical beliefs about science and humanity, and the inherent goodness of life. His students will always remember him for his compassion, kindness, integrity, enthusiasm, love of children and music, and ever present sense of humor.

One of ASBMB's main missions is to advance the science of biochemistry and molecular biology. The Society endeavors to accomplish this goal by publishing scientific journals, organizing meetings, and advocating for funding of basic research and education. Despite the Society's name, our efforts are not confined to the United States. For example, we are an Adhering Body to the International Union of Biochemistry and Molecular Biology (IUBMB), an organization that unites biochemists and molecular biologists from 66 different countries. The following article takes a look at the IUBMB and some of its recent efforts.

THE INTERNATIONAL UNION OF BIOCHEMISTRY AND MOLECULAR BIOLOGY:

Promoting Research and Education Throughout the World

BY ANGELO AZZI

Roget's New Millennium™ Thesaurus defines "*union*" as "alliance, association, brotherhood, harmony," and much more. The International Union of Biochemistry and Molecular Biology (IUBMB) is not only an association of 77 Adhering Bodies, representing approximately 70,000 individual members, but has the mission of reinforcing the alliance, the brotherhood, and the harmony among them. The assets in science are the quality of research and its rapid advancement, and these are also the scopes of the Union. Additionally, we care about a more equal distribution of the opportunities that have been, historically, differently allocated in different geographical regions and to different genders.

Our members are almost all individual organizations, biochemical societies, or academies. The unique aspect of the Union is its global outreach. The IUBMB has the ability, standing on the giant shoulders of our member organizations, to glimpse a more remote space where more assistance is necessary and more help has to be given. Guidance and vision are given by the Honorary Advisory Board of the IUBMB, including five Nobel Prize winners and several outstanding scientists as well as individuals of unique institutional memory.

The Union tries to realize harmony among its members through the organization of congresses, conferences, and special meetings (under the expert coordination of Knut-Jan Andersen) where the conditions may be more difficult and where the seeds of science may be grown, especially among the youngest generations. In 2008, 15 symposia in 12 different countries will be organized. The Union has helped Africa to create a Federation of African Societies of Biochemistry and Molecular Biology, to organize a very successful special meeting in Cape Town, and to create an African Advanced School of Biochemistry and Molecular Biology. In the capable hands of Iqbal Parker, the school will have its debut during the 1st week of March 2008, in Hermanus, South Africa. The success of this endeavor has been guaranteed by the enthusiastic participation of UNESCO, FEBS, EMBO, and IGCB.

Another example of the value of the association is given by the STAR (Student Travel and Research) Program conceived by Sergio Ferreira, which has received the passionate involvement and the financial support of the ASBMB, PABMB, and IUBMB. This program is set to start early in 2008.

Education, which is a solid Union tradition, is not the only part of our future plans. The short term Wood-Whelan Research Fellowships, professionally coordinated by Jacques-Henry Weil, fully support scientific collaboration or advanced training of young biochemists and molecular biologists from member countries. Our success rate in 2006 was 44%, and the average age of the awardees was 28.5 years. These scientists spent an average of 2.7 months in their receiving laboratories. This program is highly successful. Another way of educating young scientists is to bring them to the big meetings and to offer them a platform where they can test themselves. This is

President Angelo Azzi (left) with past President William J. Whelan

The 50th IUBMB Anniversary in Budapest, Hungary, 2005. From the left, K.-J. Andersen, A. Azzi, J.-H. Weil, B. Clark, P. Ott, F. Vella, W. J. Whelan, E. C. Slater, M. Osborn, G. Kenyon, C. Hidalgo, J. J. de Pont, V. Turk, and K.-i. Arai.

realized by the Young Scientists Program and Young Scientists Forum. They bring together approximately 25 or 100 young selected scientists during an international congress or a conference to display their work by poster or oral presentations.

Susan Hamilton, responsible for the IUBMB educational programs, is developing a vision of enhancing pedagogy and discipline-based knowledge in biochemistry and molecular biology through international collaboration, and with this a tool, "A concept inventory for the molecular life sciences." Communication, advertisement, public relations, and the implementation of a number of programs require the expert utilization of electronic tools and of the Internet. Peter Ott fills this role with his administration of the new IUBMB website, the Education Site, the On-line Discussion Forum, and the publicity at IUBMB congresses and conferences.

IUBMB Treasurer, Jan Joep de Pont, keeps the finances of the IUBMB under tight control and prepares them for audit. The running costs are kept at 20% of the budget. To increase the income and the institutional expenditures, a new entity has been created, the IUBMB Inc. As soon as the United States Internal Revenue Service grants public charity status, activities will be initiated in order to obtain donations and charity support.

The IUBMB Archives, deposited in Colchester, UK, have been scanned under the supervision of Andy Sutherland in form of searchable PDF files and have been put on line (password-protected). An Archives Committee has been set up and includes Andrew Sutherland, Ralph Bradshaw, Bill Whelan, Bill Slater, Peter Ott, and Willy Stalmans. They will organize the archives and ultimately construct a history of the IUBMB.

Willy Stalmans, besides coordinating the IUBMB journals (*Trends in Biochemical Sciences*, *IUBMB Life*, *Biochemistry and Molecular Biology Education*, *Biotechnology and Applied Biochemistry*, *Molecular Aspects of Medicine*, and *BioFactors*), has initiated the IUBMB Book Series (published by John Wiley & Sons, Inc.), and the first book has been commissioned to César Fraga and will appear in the middle of 2008. Stalmans also supervises the Nomenclature Committee and the IUBMB/Sigma-Aldrich metabolic maps and animations designed by Donald Nicholson. A Biotechnology Subcommittee (Parviz Shamlou, Stephen Dahms, Virander Chauhan, Francisco Baralle, and Andrew Marshall) has been created to develop more effective links with biotechnologies, a form of applied biochemistry and molecular biology. This committee will devote time to the emerging issue of biosecurity, associated with a possible dual use of biological technology in collaboration with United States Academies, the State Department, and the National Institutes of Health.

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Angelo Azzi is the current president of IUBMB. He is an Emeritus Professor at the University of Bern in Switzerland as well as a scientist at the JMUSDA Human Nutrition Research Center on Aging. He can be reached at angelo.azzi@tufts.edu.

More facts about IUBMB can be found at www.iubmb.org. What we want to stress here is the Union's global mission and its new undertakings, indicating a direction we want to follow in the future. Alleviating the scientific differences among countries, without bias for geography, gender, religion, or level of development, is our duty, and we believe that science can promote equality, friendship, and peace.

The 2008 Schering-Plough Research Institute Award: **Scott A. Strobel**


Strobel

The Schering-Plough Research Institute Award will be presented to Scott A. Strobel, a Howard Hughes Medical Institute professor at Yale University. The award was established to recognize young investigators for outstanding research at an early stage of their careers. Strobel will present his award lecture titled, "Three Views of RNA Catalysis: Ribozymes, Ribosomes, and Riboswitches" on Sunday, April 6, at 2:15 p.m.

"I first met Scott when he was a postdoc in Tom Cech's lab and I was on sabbatical there," recalls Thomas A. Steitz, Sterling Professor of Molecular Biophysics and Biochemistry at Yale University and Howard Hughes Medical Institute Investigator. "I was so impressed with him that I worked hard to encourage his joining the faculty at Yale, which wonderfully he did. I have watched and marveled at his scientific development over the past 11 years at Yale. In my view, Scott has now developed into a major leader at the interface between chemical biology and structural biology."

Strobel attended Brigham Young University where he earned his B.A. in 1987. He then went on to the California Institute of Technology where he worked with Peter B. Dervan and earned his Ph.D. in 1992, studying the site-specific cleavage of genomic DNA by triple helix formation. Next, he did a postdoctoral fellowship at the University of Colorado, studying molecular recognition of an RNA duplex by a ribosome with Thomas R. Cech. In 1995, Strobel joined the faculty of the Department of Molecular Biophysics and Biochemistry at Yale University, where he currently remains today as chair of the department and is also an HHMI professor.

"Scott is a chemical biologist in the best sense of the term," says Peter B. Moore, Sterling Professor of Chemistry at Yale University. "Much of the work his group has done derives from his ability to synthesize organic molecules that he can use as tools to solve important biological problems. For example, shortly after coming to Yale he made important contributions to the development of an elegant technique for determining the role of specific atoms in maintaining the structure and activities of RNA molecules."

The technique, called NAIM (nucleotide analog interference method), involved the tagging of nucleotide analogs (such as inosine substituted for guanosine to test the importance of the amino group on the base) with a phosphorothioate, allowing positions of incorporation to be revealed by iodine cleavage. Using this technique, Strobel and his colleagues were able to look at multiple functional groups on bases and on ribose sugars, and to build credible and testable models of RNA active sites such as those in the catalytic site of the group I RNA intron (1). NAIM has also been used by several other labs to identify functional groups essential for the activities of RNA, including protein binding.

Next, Strobel solved the crystal structure of the ribosome group I intron in two of its catalytically relevant states (2, 3). These structures revealed how the intron uses novel RNA motifs to select the 5'- and 3'-splice sites and the manner in which it is able to coordinate metal ions to promote the chemical reaction. The two structures were the first of the complete group I intron and were the first to establish conclusively how metal ions were utilized in catalyzing the reaction.

Strobel's research has also focused on the mechanism of the peptidyltransferase reaction catalyzed by the large ribosomal subunit. He and his colleagues synthesized a series of substrate and transition state analogues for use in biochemical and crystallographic studies to elucidate the mechanism of the reaction. Recently, he performed a set of kinetic isotope effect experiments that have characterized the transition state of the peptidyltransferase reaction.

"Scott is an outstanding synthetic organic chemist, biochemist, and molecular biologist who sees no boundaries between those fields and therefore transverses them effortlessly. In addition, he is an extraordinarily innovative teacher and mentor," says Thomas R. Cech, President of Howard Hughes Medical Institute and Distinguished Professor at the University of Colorado, Boulder.

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The 2008 William C. Rose Award: **John D. Scott**


Scott

John D. Scott, a Howard Hughes Medical Institute investigator at Vollum Institute, Oregon Health & Science University, will be presented with the William C. Rose Award at the upcoming annual meeting in San Diego. Scott will deliver his award lecture titled "Cell Signaling in Space and Time" on Sunday, April 6, at 8:30 a.m.

The Rose Award recognizes outstanding contributions to biochemical and molecular biological research and a demonstrated commitment to the training of younger scientists. Scott's work on the A-kinase anchoring protein (AKAP) family of scaffold proteins has transformed the field of intracellular signaling. He has also been an exemplary trainer of graduate students and postdoctoral fellows who have gone on to make their own contributions to the field of signal transduction.

"John's commitment to advancing the careers of others, particularly more junior researchers, sets him apart from many other leaders," says Alistair Sim, Associate Professor at the University of Newcastle in Australia. "John has a keen ability to recognize the key skills and characteristics of each individual and to mold his advice and leadership with their own aspirations to maximize their potential. It is a notable feature of John's character that he makes every effort to not only follow the careers of his previous staff but also to continue to seek ways to support them throughout their career, wherever that may be."

Scott earned his Ph.D. in Biochemistry from the University of Aberdeen in 1983, after which he became a postdoctoral fellow with Edwin G. Krebs in the Department of Pharmacology at the University of Washington. In 1986, he became an assistant professor in the Department of Biochemistry at the University of Washington, and in 1988 he joined the faculty of the University of California at Irvine as an assistant professor in the Department of Physiology and Biophysics and the Department of Biological Chemistry. Scott moved to Oregon Health & Science University in 1989 and became a faculty member of the Vollum Institute in 1990. In 1997, he was both promoted to senior scientist at the Vollum Institute and was appointed as an associate investigator of the Howard Hughes Medical Institute. In 2003, he was promoted to Howard Hughes Medical Institute investigator.

Scott's research has centered on intracellular communication and signal transduction, specifically the actions of protein kinase A (PKA). Many hormones mediate their effects by elevating levels of an intracellular second messenger called cyclic AMP (cAMP). cAMP, in turn, binds to PKA, which initiates a myriad of biochemical events by phosphorylating target proteins.

Scott and his colleagues have shown that PKA pools are compartmentalized inside the cell at their site of action, close to the proteins that they will ultimately phosphorylate. This compartmentalization allows them to phosphorylate distinct sets of proteins in response to different hormones.

Scott's research has demonstrated that type II PKA is tethered at particular subcellular locations by specific AKAPs. Each AKAP contains a conserved amphipathic helix motif that is responsible for high affinity interaction with the regulatory subunit of PKA. Scott has generated peptides corresponding to this region and shown that the peptides are antagonists of PKA/AKAP interaction and that they can disrupt the localization of the kinase when introduced into cells.

Each anchoring protein also has a unique targeting site that is responsible for its association with membranes or subcellular structures. These targeting sites direct the kinases to specific locations such as nerve terminals, and thus confer specificity to each AKAP.

"John's seminal studies on the AKAPs have stimulated the whole protein phosphorylation field to think about scaffolding proteins as mediators of signal specificity, and laid the groundwork for the discovery by others that many types of protein kinase, including mitogen-activated protein kinases, use scaffolding proteins to assemble signaling complexes," says Tony Hunter, American Cancer Society Research Professor at the Salk Institute.

Scott has also shown that AKAPs not only bind to PKA but also form complexes with additional signaling enzymes, particularly other protein serine-threonine kinases. Thus AKAPs are not simply PKA regulators but also act as a nexus for the sophisticated control of multiple signaling events.

Do We Actually Need to Care About Minorities and Diversity?

BY MARCOS E. MILLA

The answer to this question seems immediate and obvious, right? A resounding yes! ASBMB has a Minorities Affairs Committee (MAC), organizes as many as four sessions focusing on scientific health problems affecting minorities or the best practices for their inclusion in science, has a presence at national meetings organized by junior minority scientist associations, and dedicates space to minority topics in *ASBMB Today*. The question is, does this effort reflect a true commitment to attract, develop, and promote minorities in biochemistry and molecular biology, or are we just conforming to a model of political correctness that seems (fortunately) particularly developed in biomedical sciences? As a minority member of ASBMB for over a decade, I am not quite sure how to answer this question if we go beyond a superficial level populated by labels such as committees, special sessions, and focus articles.

When I joined the MAC in 2005, there were two issues that strongly caught my attention. First, for all the effort that our Society places on advertising to and recruiting young minority scientists, there is a surprising lack of follow-up on the professional health of our minority members. Do they complete graduate studies? How successful are they as postdocs and what job opportunities are available to them? How many of them succeed at their independent positions (advancement on the academic tenure track and promotion in industry)? How many of them drop out of ASBMB and science altogether? The second issue was the sparse attendance that I have observed at MAC-sponsored sessions that are part of the Annual Meeting. These sessions showcase exciting research done in highly significant medical problems where there is a critical need for innovative thinking, the kind that ASBMB members brilliantly apply to a host of scientific problems in biology and chemistry.

My conclusion from these two observations, which I feel remain valid today, is that no matter how much the ASBMB governance may do to address inclusion of minorities in biochemistry and molecular biology, ASBMB members are the ones who at the end of the day will make a difference. That level of engagement, of interest in this cause has not yet taken place. A lot of effort could be devoted to researching why this is the case, yet I believe that both the reason and the solution are quite simple: unless each of us takes *personal* interest in identifying minority scientists, mentoring them, making sure that the right institutional support is strongly behind them; unless we make a conscious decision to direct our innate scientific curiosity to problems where we, as researchers, can make a difference; and unless we embrace that level of *personal* interest and accountability, no ASBMB committee or sponsored activity can make up for actual deficits.

ASBMB members are the ones who will make a difference

Such change in attitude implies a real acceptance of diversity and its role in our Society in particular and science in general; beyond commendable moral considerations, it becomes a highly valuable instrument to bring in more interesting problems on which to focus, more points of view in approaching those problems, and more voices to the scientific debate. Yet for this to happen, we need to accept the fact that a color-blind culture, while being a reasonable ethical goal, will not by itself generate and promote diversity. The real challenge is to proactively work toward diversity as a goal without a sacrifice in scientific rigor, in a way where both concepts are not at odds. I believe this to be a critical undertaking toward promoting the cultural change that I am advocating.

My impression from multiple conversations with colleagues that I consider "color blind" is that a great deal of their resistance or lack of passion for stepping up efforts to increase diversity has to do with the perception that an increased focus on diversity will come at the price of a reduction on the quality of our science. Another telling sign

of this cultural attitude is that a few highly accomplished minority scientists that I have come across would actually feel, at the very least, uncomfortable if identified as such, as if the "minority" brand would somehow detract from their hard-earned achievements. It is interesting how perceptions actually work both ways.

This is actually a good place to point out that such a view is not exclusively tied to minority participation in ASBMB: relative to other societies, ours is lagging when it comes to involving industry members in meaningful ways. Pharma and Biotech are seen more as a sources of funding for meetings and other activities rather than a distinct source of talent and diversity in their own right. Last year, I happened to attend a few of the sessions organized by the American Society for Pharmacology and Experimental Therapeutics during the Experimental Biology Meeting in Washington, D.C. I was pleasantly impressed with the level of participation from industrial scientists at all levels. Why is this not the case at ASBMB? Is our commitment to improving global health any less than that of corporations focusing on drug discovery? Given that most scientific discoveries resulting in new cures for multiple diseases are born in academic labs, this is clearly not the case. Once again, I would venture that this is just another instance of a *no urge to change* mentality.

I would like to finish by inviting you to think about how change occurs at the individual level and how individuals shape the way in which societies, institutions, and entire countries tackle diversity issues. And on behalf of the ASBMB MAC, I would also like to cordially invite you to make use of your intellectual curiosity at the MAC-sponsored sessions this year in San Diego. You may be in for a treat and a challenge.

Marcos Milla is the Director of Biochemical Pharmacology in the Inflammation Disease Biology Area at Roche Palo Alto. He has served on the ASBMB Minority Affairs Committee since 2005 and will start serving on the Editorial Board of *JBC* in July of this year. He can be reached at marcos.milla@roche.com

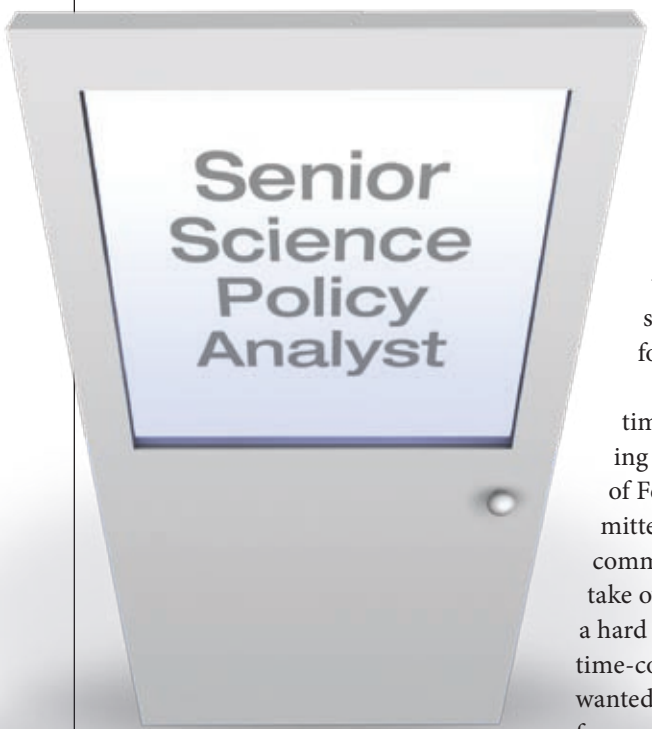
Doing the Things that Interest You

BY PHYLLIS FROSST

When I arrive at my office every morning, the plate outside my door reads "Senior Science Policy Analyst." I work at the National Human Genome Research Institute, one of the 27 institutes and centers that make up the National Institutes of Health. I never anticipated having my current job (well, maybe a little after the interview), but it's a great fit for the things that I like and the things that I do well. How do you arrive in such a place? You do that by liking what you do every day; by using the scientific understanding that you worked so hard for in a new way; and by finding a job that's a fit for you. I can tell you how I transitioned from the lab bench to a policy job with my name outside the door, and I can share the wisdom I've gained from the view on this side about how to get here.

I never really knew what I wanted to be when I grew up, but I could easily describe the kinds of *things* that I liked. When I was young, I liked animals; I liked learning new things, and I liked reading books. Working toward undergraduate and master's degrees at McGill University, the *things* I liked became more refined: molecular biology, human genetics, and cell biology.

In graduate school while getting my Ph.D. at The Scripps Research Institute, my career list changed again, from *things* to the more important "things I would like to do in a job." These included reading and learning about science, writing and presenting science for lay audiences, learning new things, taking a step back to look at the bigger picture, and having every day be different. Similar to many young scientists who decide that the bench is not the place for them, I had a passion for science but not really for hands-on research.



I had the good fortune, at this time, to have been a long standing member of the Scripps Society of Fellows (SOF) executive committee. When the president of the committee got a job, I was asked to take over as president. I had to make a hard decision about undertaking a time-consuming position that I really wanted but would take time away from what would theoretically be best for my career, spending more time in the lab. I decided to follow what was really drawing me and accepted. I was president of the SOF until I left Scripps, and this decision in large part led me to the policy job I have now.

Being president of the SOF let me do two important things: 1) engage with the administration at the institute on behalf of the postdoc community, and 2) make our new priority helping postdocs and graduate

Phyllis Frosst

Phyllis Frosst is a science policy analyst and the acting Branch Chief of the Policy and Program Analysis Branch at the National Human Genome Institute at the NIH in Bethesda, Maryland. She received B.Sc. and M.Sc. degrees with honors from McGill University in Montreal and earned a Ph.D. in Cell and Molecular Structure and Chemistry from the Scripps Research Institute in La Jolla, California.

students find jobs. The competition in San Diego for jobs was pretty fierce. Among other events, we brought in a career coach who taught us how to network and to get the job we really wanted. Marla Gilson explained enthusiastically and in detail the ways to expand our networks, how to write a good curriculum vitae (CV) and cover letter, and how to interview. Probably the most important personal lesson Marla taught was self-confidence and being your own best advocate. In a job interview, the only person who can talk about how great you are is you. Her best professional tip was to tailor your letter and CV for each job application.

So I networked and realized that science policy matched what I wanted. A conference in Washington, D.C. allowed me to visit with friends who were enjoying policy work, after which I focused my job search in that direction. When I found the posting for my current job, it listed policy experience as essential. Concerned that this would disqualify me for the job, I spoke with a good friend in Washington who reminded me that my SOF experience *was* science policy. I had been doing what I enjoyed, and it had led me to the job I wanted. A lot of preparation and a good interview got me the job, and I mentally thanked Marla for teaching me the skills I needed.

The most frequent question I get about my job is "what do you actually *do*?" This is, in fact, not an easy short-answer question. I do lots of different things, and they're different everyday, and really, that is part of what makes being in policy interesting. At the National Institutes of Health (NIH), I do a lot of writing, for example to Congress: how progress is being made at our institute towards better health for us all. I work on issues, like pharmacogenomics or the oversight and regulation of genetic testing. I go to meetings and participate in different committees that are thoughtful about relevant issues. I go to meetings of all flavors, usually a couple every day. I do some legislative affairs; my colleague leads our efforts, but I follow action on Capitol Hill, follow current legislation, and go to hearings and other Hill happenings. I do a LOT of email. Additionally, I support the institute's director with whatever is needed; sometimes it's a slide, sometimes a summary. That is really the short answer!

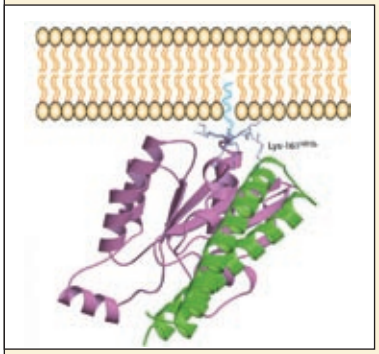
If you keep doing things that interest you, you'll probably find a job that you enjoy

I use a lot of scientific skills such as reading the scientific literature, writing, presenting, and analytical thinking, but I also do a lot of networking. I learn about new fields like evaluation or public health; I work with large diverse groups, and I follow the popular media for stories that relate to what we do. I have the privilege of working in an office of doctors, lawyers, nurses, and communication and education specialists, who not only show me new ways of thinking but make me feel that I have a valuable perspective to contribute to the group. I work with smart, dedicated people and feel privileged to be here. The pace is fast; my "to do list" changes all through the day, and there's always something new to get up to speed on. But since finding a job that doesn't *ever* feel like work is in fact a fantasy, I can firmly say that I really like what I do.

So how do you get a job in policy? Good communication and writing skills, of course, but a key criterion is a demonstrated interest in policy, whatever form that may be. Some people volunteer at a political office, participate in a relevant group or association and gain some leadership experience, some join a postdoctoral society, as I did, either at a local or national level (www.nationalpostdoc.org/); really, the possibilities are as endless as your imagination. The most straightforward path is to get a policy fellowship. These generally include working on Capitol Hill, an exceptionally valuable experience that will stand out on your CV. The good news is that fellowships pay pretty well, and the bad news is that they're hard to get (harder if you're not a United States citizen). Most importantly, talk to people! Use informational interviews to meet people in interesting and high level positions. Email or call and explain that you're thinking about your career and are interested in meeting to learn what they do and how they got there. Everyone likes to talk about themselves, so most people will say yes; after all, you're not asking for a job, you'd just like to talk.

Here's the big finale with the dancing dogs and elephants jumping through hoops! If you keep doing *things* that interest you, you'll probably find a job that you enjoy: a job that feels exciting; a job that feels like you're doing something that has meaning; a job where seeing the title outside your office door makes you smile before you open the door and walk in.

Rac1 C Terminus Contributes to Effector Binding



Interaction of the polybasic region (blue) of Rac1 (purple) with PRK1 (green) does not disrupt membrane anchoring.

Members of the Ras family of G proteins act as key switches in signal transduction pathways through their binding and activation of effector proteins. The G protein Rac1, for example, activates protein kinase C-related kinase 1 (PRK1), a critical regulator of the cytoskeletal network as well as other diverse processes. In this *JBC* paper, the authors have determined the structure Rac1 in complex with its effector PRK1, with a twist. The Rac1 crystal structure, unlike those of most G proteins, was solved with its membrane-anchoring C-terminal region intact. The structure revealed that the Rac1 C terminus reverses direction to interact with residues in the G protein core, whereas the polybasic region of the C-terminus in fact interacts directly with the HR1b domain of PRK1. These interactions, however, do not hinder the ability of the polybasic region to interact with negatively charged phospholipids to tether Rac1 to the cell membrane. This study provides the first structural demonstration that the C terminus of a G protein forms an important recognition element for effector binding and could have profound implications for Rac1-mediated signal transduction.

The RAC1 Polybasic Region Is Required for Interaction with Its Effector PRK1

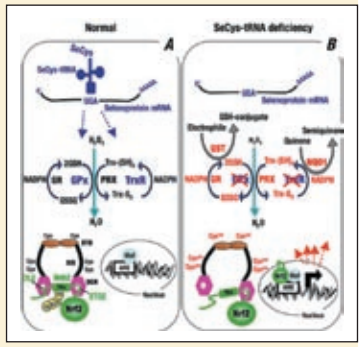
Rakhee Modha, Louise J. Campbell, Daniel Nietlispach, Heeran R. Buhecha, Darerca Owen, and Helen R. Mott

J. Biol. Chem. 2008 **283**, 1492–1500.

jbc

Selenoprotein Depletion in Mice

Selenoproteins play essential roles in both development and adulthood, mainly through their functions in balancing cellular redox levels. Because selenoproteins require a trace micronutrient and specialized translational machinery, however, they seem ill-suited to handle rapid or drastic changes in redox state. In this *JBC* paper, the authors examine how cells cope with selenoprotein depletion that may be brought on by dietary deficiencies in selenium or translational inhibition by statin drugs. They developed a conditional knock-out mouse for the selenocysteine tRNA gene (Trsp) and observed that Trsp deletion in macrophages or liver resulted in the induction of several cytoprotective agents to counter the elevated oxidative stress. The upregulated antioxidants, which include glutathione S-transferase P1 and NAD(P)H quinine oxidoreductase 1, are known targets of the transcription factor Nrf2, and mice with a double knock-out of Trsp and Nrf2 displayed a severely compromised cytoprotective response, increased cellular apoptosis, and a reduced survival rate. These results reveal that the Nrf2 gene battery acts as a rapid response agent to assist or replace selenoprotein activity when necessary.



Model for the compensatory gene induction by Nrf2 in the absence of selenoprotein production.

Deletion of Selenocysteine tRNA Gene in Macrophage and Liver Results in Compensatory Gene Induction of Cytoprotective Enzymes by Nrf2

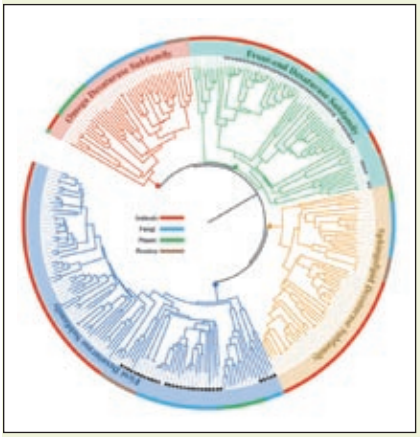
Takafumi Suzuki, Vincent P. Kelly, Hozumi Motohashi, Osamu Nakajima, Satoru Takahashi, Susumu Nishimura, and Masayuki Yamamoto

J. Biol. Chem. 2008 **283**, 2021–2030

jbc

Building Diversity in Fatty Acids

Fatty acids, which are the essential components of biomembranes, have great structural and functional diversity. This wide range of fatty acid structures is determined by the actions of two types of enzymes: elongases and desaturases. Elongases are responsible for fatty acid chain elongation and desaturases create double bonds in the fatty acid chains. The authors of this *JLR* paper systematically looked at 56 eukaryotic genomes and obtained 275 desaturase and 265 elongase homologs. Their analysis showed that the desaturases consisted of four functionally distinct subfamilies whereas the elongases consisted of two subfamilies. The authors also discovered that many organisms, even closely related ones, can synthesize different ranges of fatty acids. They reasoned that this was because, in addition to diverging into subfamilies, the enzymes diverged within the individual subfamilies. In conclusion, the authors discuss how adaptation to individual environments and the ability to synthesize specific metabolites provides some explanation for the diversity of enzyme functions.



Desaturases consist of four functionally distinct subfamilies.

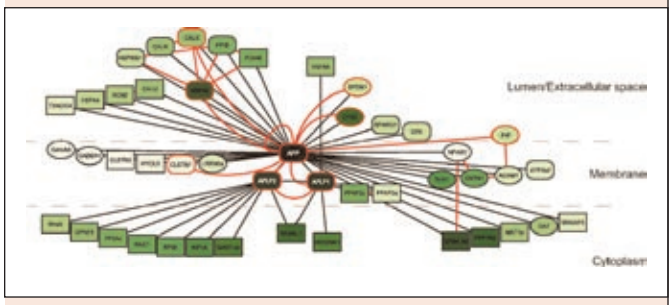
The Repertoire of Desaturases and Elongases Reveals Fatty Acid Variations in 56 Eukaryotic Genomes

Kosuke Hashimoto, Akiyasu C. Yoshizawa, Shujiro Okuda, Keiichi Kuma, Susumu Goto, and Minoru Kanehisa

J Lipid Res. 2008 **49**, 183-191

The Amyloid Precursor Protein Interactome

Alzheimer's disease is the most prevalent neurodegenerative disorder worldwide. A defining pathological hallmark of the disease is the deposition of plaques, consisting mostly of amyloid β-peptide. This peptide is generated by the consecutive cleavage of the amyloid precursor protein. Despite intense research efforts, the physiological function and molecular ligands of this precursor protein have remained enigmatic. In this paper, the authors use a technique called time-controlled transcardiac perfusion cross-linking to study the interactome of the amyloid precursor protein. By pumping cross-linking reagent through an animal's circulatory system for a short time, the investigators were able to cross link proteins *in vivo* and then isolate and study them. They were able to confirm previously reported interactions of the amyloid precursor protein and also reveal 30 new proteins that interact with amyloid precursor protein.



The APP protein family interactome.

The *In Vivo* Brain Interactome of the Amyloid Precursor Protein

Yu Bai, Kelly Markham, Fusheng Chen, Rasanjala Weerasekera, Joel Watts, Patrick Horne, Yosuke Wakutani, Rick Bagshaw, Paul M. Mathews, Paul E. Fraser, David Westaway, Peter St. George-Hyslop, and Gerold Schmitt-Ulms

Mol. Cell. Proteomics 2008 **7**, 15-34

Carolyn Bertozzi: Innovations in Glycobiology

BY NICK ZAGORSKI

People don't usually think of our cells as "sweet," but just like a sugar-coated tablet, each cell surface is plastered with an abundance of oligosaccharides and polysaccharides that are attached to surface proteins and lipids. This assortment of glycans, long, short, branched, and straight, is more than just icing on a cake, however; glycans play central roles in cell recognition, cell adhesion, protein stability, and protein trafficking, to name just a few.

For a long time, however, researchers interested in glycosylation had their work cut out for them, as the study of glycans simply did not lend itself to the same molecular tools that could be used to answer fundamental questions about proteins and DNA. But Carolyn Bertozzi, the T.Z. and Irmgard Chu Distinguished Professor of Chemistry and Professor of Molecular and Cell Biology at the University of California, Berkeley, has been hard at work to change all that.

Bertozzi's lab aims to understand the relationship between glycosylation and disease, particularly how glycans contribute to bacterial infection and the changes in glycosylation that accompany cancer onset and progression. Along the way, she has used her natural knack for chemistry and innovative thinking to develop a multitude of new tools that she and others can use to image, profile, and manipulate cell-surface glycans as never before.

Music to Her Eyes

The creative mind-set that keys much of Bertozzi's success can be traced back to her youth, growing up the middle of three daughters in the suburbs of Boston in the 1970s. Her father, William, encouraged all three girls to excel in science and math, which comes as no surprise considering he is a physics professor at the Massachusetts Institute of Technology. To help foster their interests, William constantly brought home scientific "toys" from MIT, and the girls got to play with Rubik's cubes and home computers long before they became household items.

Bertozzi's lab aims to understand the relationship between glycosylation and disease

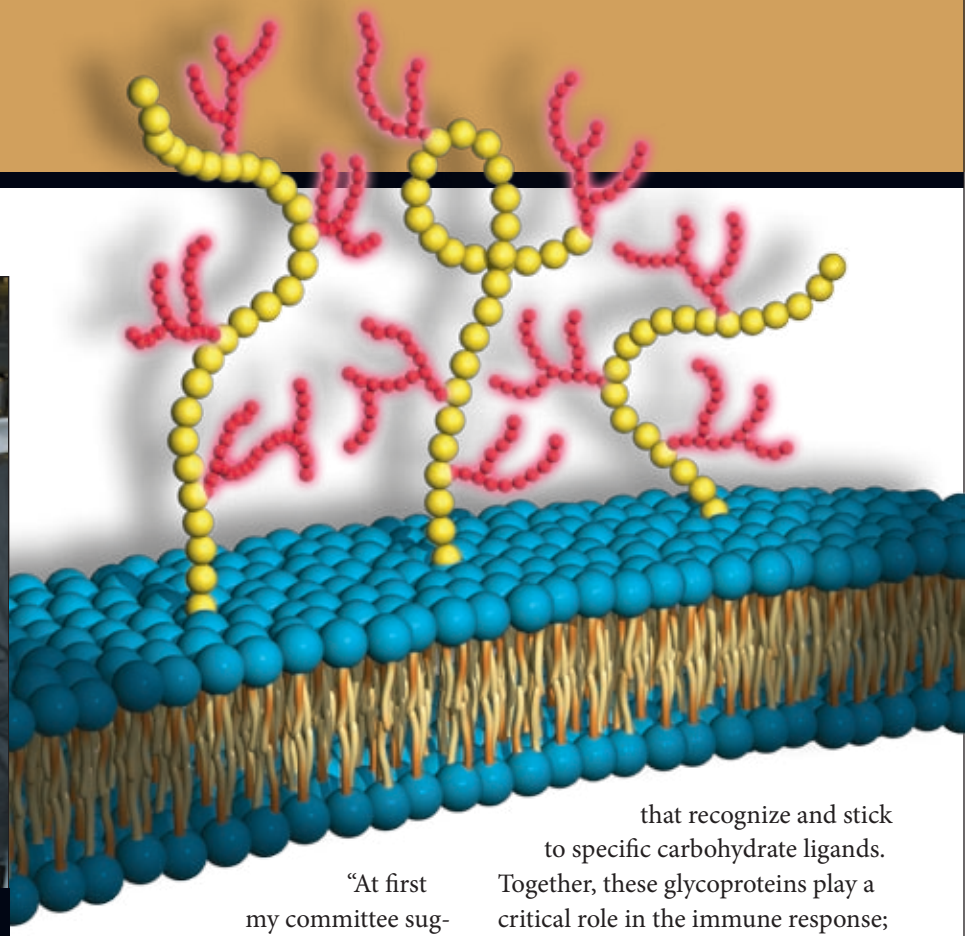
But while older sister Andrea quickly emerged as a mathematical genius (she is currently a professor of mathematics at UCLA), Bertozzi took longer to find her niche. She initially tried following in Andrea's footsteps, but Bertozzi never felt a true connection with math. She also picked up music, teaching herself the piano and playing for various high school music groups. For a while she thought about pursuing a musical career and joined a college rock band after she enrolled at Harvard University.

Within Harvard's ivy walls, Bertozzi found her calling, but it would not be blaring out heavy metal riffs. As a biology major, she was required to take organic chemistry, and while this course can be tedious to some, for Bertozzi it clicked immediately. "I just fell in love with it," she recalls. "The visual aspects of the material completely appealed to me. I loved drawing the molecules, imagining what they look like in 3D, and pushing electrons around to see how reactions played out."

Bertozzi graduated from Harvard with a degree in chemistry in 1988, although her conversion to the chemical side was not entirely complete. "I still enjoyed biology, and I wanted to go to a graduate program where I could work at the interface of these two disciplines." She was also ready to venture beyond the greater Boston area and turned her eyes towards Berkeley. "I was impressed by both the energy and science on their campus," she says. "Berkeley had numerous researchers doing bio-organic chemistry, the field we now call chemical biology."

One of those researchers was Mark Bednarski, a recently appointed carbohydrate chemist. Bertozzi had actually previously met Bednarski, as he had just completed his postdoc with George Whitesides at Harvard. "Once word got out that I was interested in Berkeley, he contacted me and suggested I work for him," she recalls. She considered other labs on campus, but Bednarski's youth

Carolyn Bertozzi



and enthusiasm, not to mention the opportunity to be one of his first graduate students, won her over.

Of course, Bertozzi didn't know all that much about carbohydrates. However, she soon realized that not many other scientists did either. "Compared with proteins and DNA, carbohydrates were really understudied," she says, "especially in regard to synthesis. So, as a class, carbohydrates still needed good solid chemistry, and this was really cool, because that meant we could make really fundamental breakthroughs."

Bertozzi's graduate work involved designing synthetic analogs of glycosides (sugars attached to other moieties) called C-glycosides, replacing key carbon-oxygen bonds with nonhydrolyzable carbon-carbon bonds, and then testing how the analogs affected biological activities like cell-cell binding. Her time at Berkeley also became a crash course in independence, as Bednarski became ill with cancer in 1991 and took a leave of absence, eventually leaving Berkeley altogether to attend medical school at Stanford.

"At first my committee suggested that I find a new project and advisor," Bertozzi says, "but I really didn't want to start over. So I met with my chair and pled my case that I was far enough along to finish my dissertation. And, somehow, I convinced him." She wrapped up her glycoside analysis, drove her dissertation across the bay so Bednarski could look over it, and received her Ph.D. in 1993.

Selectin a Path

While Bertozzi's graduate studies had a biological aspect, most of her work involved synthetic chemistry, so when she was finishing up she began looking for post-doctoral positions in "real biology labs." The only hindrance was that, being trained as a synthetic chemist, she lacked expertise in biological techniques. However, Bertozzi picked an ideal time to break into a new field, as researchers had recently uncovered a new class of proteins called selectins.

Part of the broader family of lectins, selectins are a family of three adhesive glycoproteins found on the surface of endothelial cells, leukocytes, and platelets (termed E-, L-, and P-selectins) that recognize and stick to specific carbohydrate ligands. Together, these glycoproteins play a critical role in the immune response; they help guide leukocytes along the endothelial wall toward the site of damage or infection and also contribute to extravasation, whereby the leukocytes squeeze out of the bloodstream to reach the affected tissue.

"That discovery proved to be a big turning point in glycobiology," Bertozzi notes. "Before that, carbohydrate conferences tended to be pretty small, attended by the same small circle of researchers. After selectins were found, immunologists, structural biologists, and people in the pharmaceutical industry all needed to learn about the significance of carbohydrates, and they started showing up at carbohydrate meetings. As it's grown over the past 20 years, I think we now realize that the term "glycobiology" is artificial and that the field truly encompasses all aspects of biology."

One of the early trailblazers in selectin research was Steven Rosen, a professor at nearby University of California, San Francisco, who had successfully cloned L-selectin and some of its ligands. "But while he had identified the protein components,

the actual structures of the sugars to which L-selectin was binding weren't known," says Bertozzi, "so there was an opening for my particular skill set. So I basically called him up and said, 'You need a chemist.'" For the second time in 3 years, Bertozzi had to plead her case, and for the second time, it worked; Rosen brought her on board.

Switching over to a biological setting did require a fair bit of adjustment. "I came into Rosen's group as an expert on the chemistry of sugars and considered myself pretty capable," she says, "but now I was demoted to lab idiot." Bertozzi took full advantage of the situation, however, and over the next 2 and a half years she learned a great deal about protein biology and molecular techniques. She also held up her end of the bargain and used her chemistry know-how to help the team identify that a sulfated tetrasaccharide known as 6-sulfo sialyl Lewis-x was a major recognition target for L-selectin. Using that structural information, she designed several synthetic sugar analogs that could inhibit selectin binding, opening the doors to drug development.

By now, Bertozzi was really enjoying the Bay area and was hoping to be able to continue her research career in California. As fortune or fate would have it, just a year after she started her postdoc, faculty positions opened up at three nearby schools (Stanford, Berkeley, and UCSF). After interviewing at all three, she decided to cross the Bay Bridge one more time and return to Berkeley.

Tag, Glycan, You're It

Bertozzi decided to start her faculty career with a challenge: to develop a reporter system for glycans, unheard of at the time. "Researchers knew that the glycan composition on any cell surface changed during both normal development and disease, but we had no way to visualize those changes in live organisms," she says. "But since we had a decent understanding of the metabolic pathways that create these surface glycans, I thought we might be able to exploit those chemical reactions inside the cell to visualize the products on the cell surface."

With her extensive background in synthesizing "unnatural molecules," Bertozzi believed that she could design modified glycans that would be

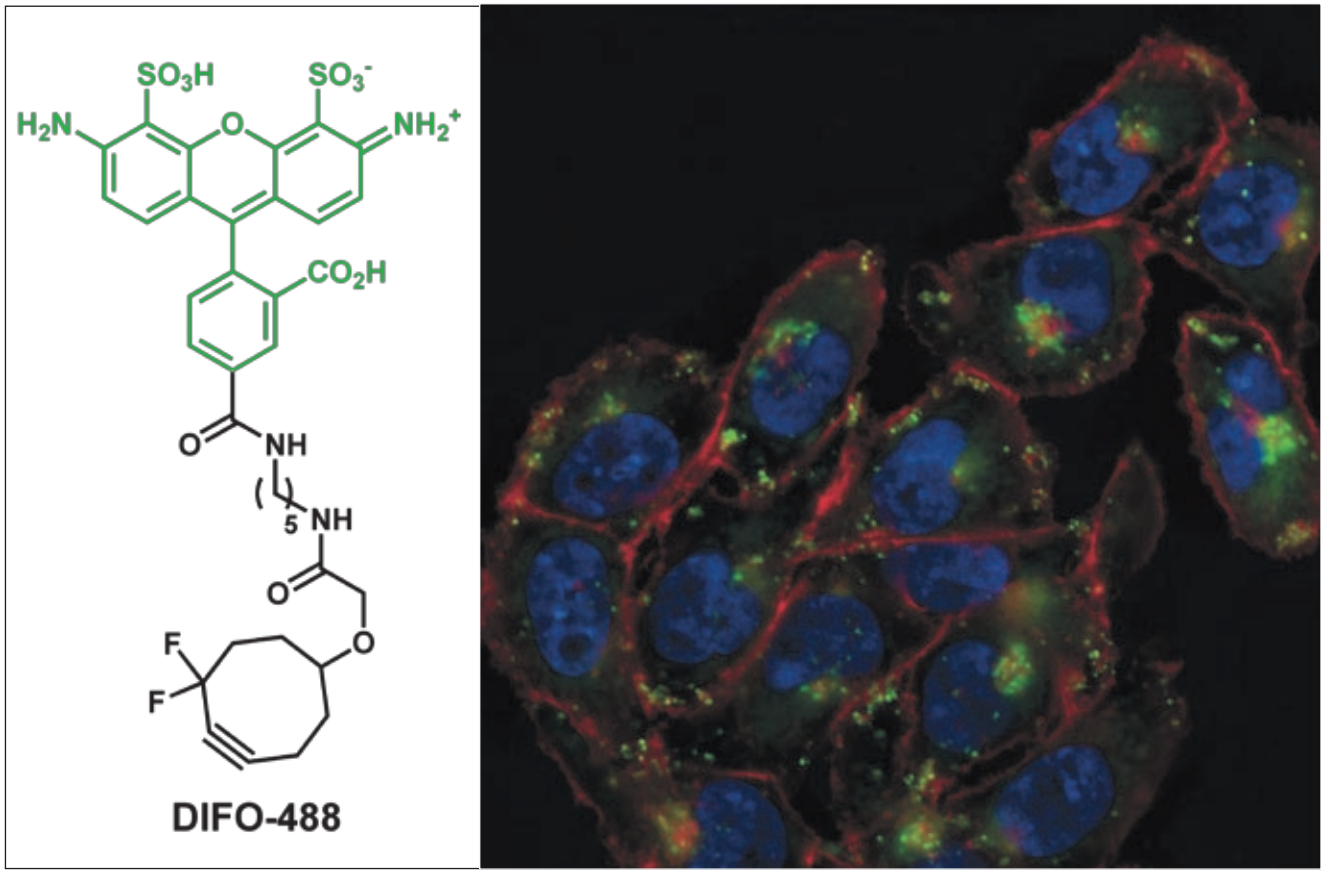


Figure 1. Imaging cellular glycans using metablic labels and chemical reporters. Cultured cells treated with an azido sugar to metabolically label their glycans were reacted with difluorinated cyclooctyne-functionalized fluorescent probes (diagramed on left) at different time points in order to visualize temporally distinct glycan populations.

IMAGES WERE AQUIRED BY GRADUATE STUDENTS JEREMY BASKIN AND SCOTT LAUGHLIN.

produced in the cell and expressed on the surface like their normal counterparts. If properly functionalized, the modified glycans could be tagged by a chemical reaction with an imaging probe and visualized using molecular imaging techniques.

This particular exercise in electron-pushing would not be easy, however. "In the field of organic synthesis, inventing new reactions is facilitated by the ability to use homogeneous inert solvents," she explains. "By contrast, we needed to invent reactions that proceed in the context of living cells and live organisms, a medium that puts a lot more limitations on what reactions can be performed."

Her first effort involved creating modified sialic acid residues by feeding cells a precursor molecule, *N*-levulinoylmannosamine, harboring a ketone group instead of the *N*-acetyl group. She could then selectively link additional molecules onto the modified sialic acids, as ketones are typically not present on the cell surface. With this approach, she could add additional sugar molecules to change the cell's glycoprotein composition and thus give it new binding features, or even create artificial receptors by attaching antibodies or other polymers.

Despite its success and applicability, Bertozzi wasn't satisfied with ketone-based reporters, primarily because they would be useless inside cells due to the numerous other ketone metabolites. Furthermore, the ketone chemistry was not ideal for visualizing sugars in living organisms. So, in 2000 her lab took another approach, updating a "classic" reaction known as the Staudinger reaction, which occurs between a phosphine (PR_3) and azide ($R\text{-}N_3$) to eventually produce an amine. They modified the phosphine with an ester group so when the two components came together they form a stable amide bond, thus converting the Staudinger reaction to what Bertozzi named the "Staudinger ligation."

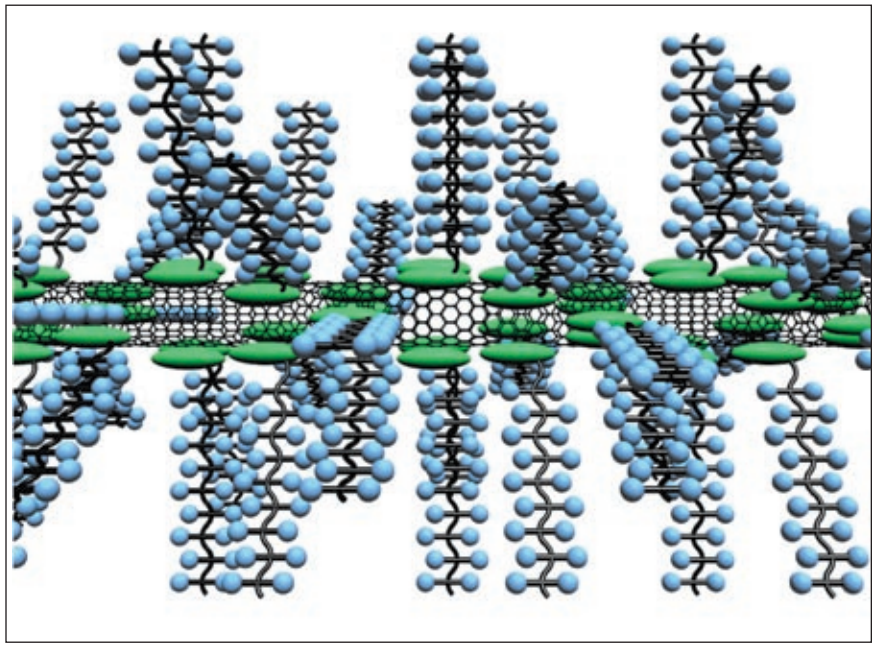


Figure 2. The tube is a carbon nanotube coated with glycosylated polymers to increase biocompatability.

"I believe this was the first example of using an azide as a biological tag," says Bertozzi, "and I think many in the field of chemical biology took inspiration from that finding." She notes that azide-based reporters have since expanded greatly and are used to label proteins, capture targets of small molecule inhibitors, and identify other post-translational protein modifications.

While the Staudinger ligation proved useful for linking fluorescent tags to modified glycans on cells and even in live mice, real time studies have been hindered by the slow kinetics of the reaction. Recently, however, Bertozzi has developed a much faster reaction of azides with cyclic molecules called cyclooctynes, using the relief of ring strain as the reaction's driving force. She is teaming up with researchers at Stanford and Johns Hopkins to design a wide variety of imaging probes to take advantage of this faster reaction.

A Little Sulfur on the Side

But the glycans themselves are only part of the story; within the Golgi apparatus enzymes known as glycosyltransferases assemble these structures and attach them to proteins. By regulating these enzymes, researchers could control specific glycan expression and see how that affects cell behavior. To aid this search, Bertozzi's group has developed small molecule modulators of glycan enzymes, such as a clever strategy exploiting the fact that glycosyltransferases are composed of two domains that need to come together to operate. Her lab engineered separate domains that localize in the presence of a small molecule drug, thus enabling for induced and reversible enzyme activation.

With these assorted tools in hand, Bertozzi's team has been dutifully probing the structural and functional characteristics of cell-surface glycans. One of their main thrusts these past few years has been to better understand *O*-linked glycosylation. *O*-Linked glycans, attached to a serine/

Out of Focus: A Brush with Fame

When not investigating chemical reactions at Harvard, Carolyn Bertozzi sang and played keyboard for a local heavy metal band called "Bored of Education." And with an impressive resume that includes distinguished professor, National Academy of Sciences member, and MacArthur genius recipient, Bertozzi has had a pretty good post-band career. But she's not the only one; it turns out the guitarist of this little college band was none other than Tom Morello, who would later achieve his fair share of success as a founding member of two slightly more well known groups: Rage Against the Machine and Audioslave. "It certainly helps raise my 'cool quotient' when I tell students this story," she says.

threonine hydroxyl group, are nearly as prevalent as *N*-linked glycans attached to asparagines, yet have been far less studied. "We don't yet know the full spectrum of *O*-linked proteins or all the enzymes involved in *O*-glycosylation," she says. "We don't even know the consensus sequence on the proteins."

These underappreciated glycans can be valuable disease prognosticators, however; changes in *O*-linked glycosylation are associated with both cancer and diabetes. Bertozzi believes that *O*-glycan composition could be used as a biomarker for cancer detection. "The problem with protein-based biomarkers is that blood has so many abundant proteins like albumin that act as 'noise,'" she says. "But if we tune our analysis to focus only on glycoproteins, we can cancel out a lot of that noise." Bertozzi is currently developing a method to identify azide-tagged *O*-glycans using mass spectroscopy so she can compare the exact changes in normal and tumor-bearing mice.

Along the way, Bertozzi's lab has picked up some interesting side projects. Besides glycosyltransferases, another important set of glycan-modifying enzymes are the sulfotransferases, which add sulfate esters to certain sugars (as Bertozzi found in her postdoc, sulfate groups are key mediators in cell-cell interactions). In 1999, while analyzing some gene sequences, graduate student Joseph Mougous discovered that the recently completed *Mycobacterium tuberculosis* genome contained four sulfotransferase genes that closely resembled eukaryotic ones. In a reversal of roles, Bertozzi now found herself on the receiving end of an unusual proposal.

"We didn't work with bacteria in our lab," she says, "but Joseph convinced me that finding out what these sulfotransferases were doing in tuberculosis would be a worthwhile pursuit." At that time, only one sulfated compound, sulfolipid-1, had been identified in these pathogenic bacteria, and the biosynthesis of that molecule wasn't fully understood either. Since picking up that project, her lab has identified several new sulfated molecules on the *M. tuberculosis* cell surface, as well as the metabolic machinery behind their production. Their current goal is to pinpoint the sulfated compounds that are most critical for virulence and hopefully identify some new drug candidates.

And if all that wasn't enough to keep one busy, Bertozzi has taken her love of biological tools to a whole other level, the nano level. Along with Alex Zettl, a colleague in the Berkeley Physics department, she has been working with carbon nanotubes (CNTs), tiny yet extremely strong wires that have tremendous potential but suffer from a fairly large drawback, cytotoxicity. To make CNTs more biocompatible, Bertozzi employed a strategy to protect cells by covering the nanotube with glycosylated polymers resembling natural cell-surface glycoproteins. She and Zettl have already developed their first technology with these modified nanotubes, a nanoinjector that can deliver molecules inside the cell without any damage, and they are exploring other applications as well. And to think, all it took was a little sugar-coating.

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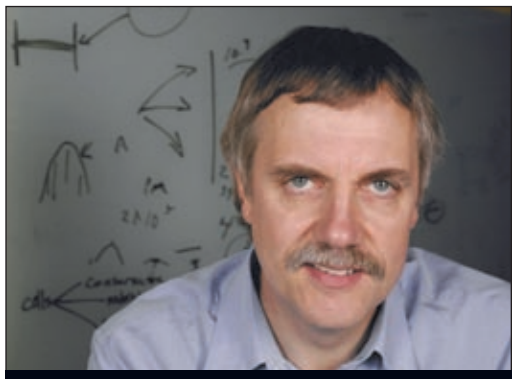
Ruedi Aebersold: Bringing Proteomics into the 21st Century

BY RASHMI NEMADE

The genomes of many organisms are now known, but what do they mean? What do all the genes code for and how do all the proteins interact? Proteins are the real effectors of all biological activities from signal transduction within a cell to hormone communication between distal sites. Measuring protein structure, function, expression, modifications, and degradation provides insight into how they may interact in biological systems. This is the field of proteomics, and it is enormously complicated because proteins are always changing.

One of the pioneers of proteomics is *Molecular and Cellular Proteomics* Associate Editor Ruedi Aebersold. Aebersold, full professor at the Institute of Molecular Systems Biology at the Swiss Federal Institute of Technology (ETH) and the University of Zurich in Zurich, Switzerland, and co-founder of the Institute of Systems Biology in Seattle, Washington, has spent his career advancing the field of protein chemistry from the first primitive and painstaking amino acid sequencing to today's rapid, high-tech, high-throughput protein measurements. "Over the years, techniques in protein detection have gotten faster while having to use much less material than before. They're just getting better and more efficient," says Aebersold excitedly.



Ruedi Aebersold

As a teenager in his native Switzerland, Aebersold recalls, "I was always interested in how things worked, especially how living things functioned." After his undergraduate studies in biology at the Biocenter of the University of Basel in Switzerland, Aebersold earned his Ph.D. in cellular biology at the Biocenter of the University of Basel in 1983. During his graduate work, he studied how immunoglobulins recognize the huge varieties of antigens they encounter. Antibody diversity is generated by the number of specific protein structures that come into contact with B cells to generate antigen-specific immunoglobulins. Learning the sequences of variants could have taken a lifetime. Through the course of this work, Aebersold realized how limited the field was by the methods available for amino acid sequencing. Edman degradation was the most popular technique. It determined the sequence of a protein by removing the amino acids one-by-one and then analyzing them. The method is very laborious and slow, however, and required large amounts of the material being analyzed.

> *"This is the field of proteomics, and it is enormously complicated because proteins are always changing."*

This frustration was channeled into a postdoctoral fellowship in 1984 with Leroy Hood at the California Institute of Technology in Pasadena, California. "I wanted to move ahead the frontiers of instrumentation to get meaningful measurements at higher speed and sensitivity. At the time, Lee Hood's lab led the best effort in the world to develop sensitive technology for protein analysis," recalls Aebersold. About the same time, molecular cloning was becoming more available and significantly cut the time searching for proteins. "With cDNA

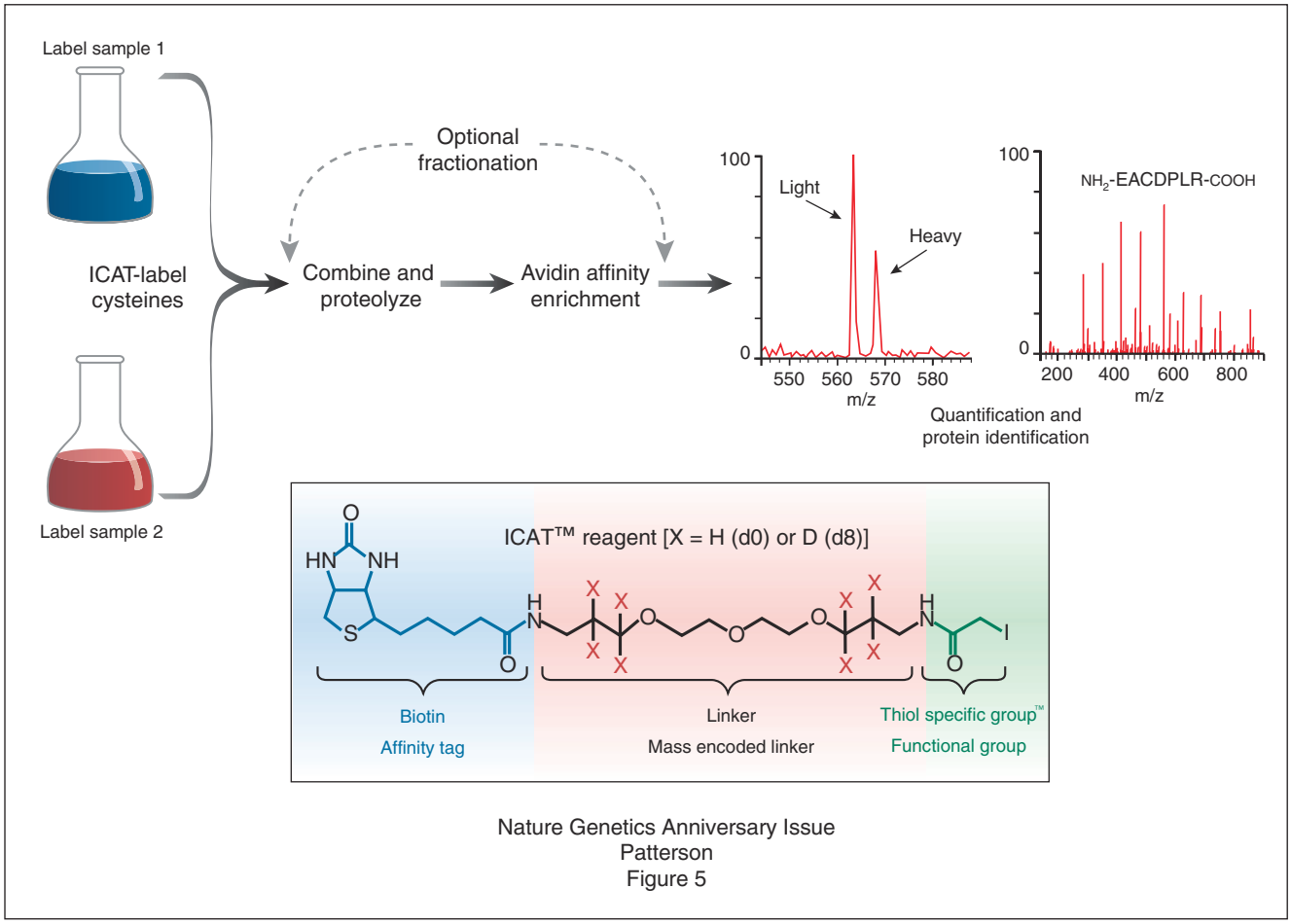


Figure 1: QUANTITATIVE PROTEOMICS USING ICAT REAGENTS.
The ICAT reagent comprises a protein-reactive group, a mass-encoded linker, and an affinity tag. The protein-reactive groups are labeled with either light or heavy reagent and then mixed and digested by enzymes. The labeled peptides are then captured and quantified and identified by liquid chromatography-tandem mass spectrometry.

cloning, we could go backwards from a protein, find the gene sequence, and clone the gene. This advance in genomics was critical to the advent of proteomics." At this stage, "the technology was improving all the time," says Aebersold excitedly.

After his postdoctoral fellowship research, Aebersold took an Assistant Professor position at the University of British Columbia in Vancouver, Canada. "Working at the Biomedical Center at UBC was lots of fun. The environment was open and fostered lots of collaboration and exchange of ideas," says Aebersold. He continued the work from his postdoctoral days identifying proteins with mass spectrometry technology—breaking down molecules into ions and then separating the ions by mass and charge. "This technique allowed for lots of progress," says Aebersold.

In 1993, he was recruited to be a full professor by his former mentor, Leroy Hood, to the University of Washington in Seattle in a multidisciplinary program. "It was at this time that the field of proteomics really got started. The computational advancements and advancements in genomics made the methods for protein detection much better." It just wasn't protein biochemistry anymore.

Although proteomics technology was advancing, Aebersold longed to measure proteins and their interactions in complex systems. By 1999, he had developed a technique to accurately quantify and concurrently sequence individual proteins within complex mixtures. This seminal work, which appeared in *Nature Biotechnology* in 1999, is what credits Aebersold for pioneering quantitative proteomics. The method is based on a class of chemical reagents termed isotope-coded affinity tags (ICATs) and tandem mass spectrometry. This technique consists of alkylating the cysteines of proteins with either a light or a heavy tag, which contains protons or deuteriums (H or D), respectively, or alternatively ^{12}C or ^{13}C. After digestion of the pooled protein samples with an enzyme, the proteolytic peptides are analyzed by

mass spectrometry. The cysteine-containing peptides are detected as doublets, and their relative intensity reflects the relative abundance of the original protein in both samples. The ICAT reagent comprises a protein-reactive group (such as a sulfhydryl-specific reactivity), a mass-encoded linker, and an affinity tag (such as biotin). Variations of any of the three can be used to facilitate the quantification of many different modifications or activities. For example, the protein profiles can be determined by this method to differentiate cells in different states, such as non-cancerous *versus* cancerous cells. "Now, we could see changes that we could not before with mass spectroscopy alone," Aebersold says. Figure 1 illustrates the technique.

In 2000, Aebersold, Lee Hood, and Alan Aderem co-founded the non-profit Institute for Systems Biology (ISB) in Seattle, Washington. The Institute emerged as a result of a new research model called Systems Biology, which is a revolutionary approach to analyzing biological complexity and understanding how biological systems function. The Institute includes a multidisciplinary group of scholars and scientists (biologists, mathematicians, and engineers to computer scientists and physicists) in an interactive and collaborative environment. This group strives to tackle key elements of human biology and disease. Researchers in the Aebersold lab, pursuing such questions, have available to them not only fully mature high-throughput applications but also experimental technologies still under development. As a result, research in the Aebersold lab involves both proteomic technology development and actual proteomic research applications. This symbiotic relationship of mature and newly emerging technologies nurtures the development of powerful new approaches to biological investigation.

In 2002, the ISB was awarded a $19.8 million contract to advance the state-of-the-art in proteomics. "This contract established ISB as one of only 10 centers nationwide for the NHLBI's long term proteomics initiative," says Aebersold. The centers are intended to focus on developing new technologies in the context of significant research problems in heart, lung, and blood diseases.

While keeping his part-time appointment at the ISB in Seattle, in 2004 Aebersold accepted a primary position as full professor and founding chairman at the Institute of Molecular Systems Biology at the Swiss Federal Institute of Technology (ETH) in Zurich with a joint appointment at the University of Zurich. His laboratory in Zurich focuses on biomarkers for diseases and signal transduction. Aebersold remarks, "We are interested in learning how networks of proteins interact in complex biological systems and making dynamic measurements of these environments."

Protein biomarkers as diagnostic or prognostic indicators of disease are playing a larger than ever role in medicine. Furthermore, biomarkers are becoming even more critical to drug discovery and development. In order to increase the likelihood of identifying low abundance biomarkers in body fluids, this group, in close collaboration with the ISB in Seattle, is working on a platform combining a solid phase extraction of glycopeptides from complex serum samples, identifying and quantifying those proteins by tandem mass spectrometry, and then analyzing the results by computational tools.

In the signal transduction area, quantitative proteomics techniques are especially well suited to measure signaling networks and learning more about their dynamic behavior. "Cells respond to environmental cues such as hormones or nutrients by activating distinct intracellular signal transduction pathways, typically involving cascades of protein phosphorylation, that adapt cellular parameters like metabolism and gene expression patterns to the altered conditions," says Aebersold.

Because the work that the Aebersold groups are doing is so innovative, one wonders what are some of their most interesting and surprising discoveries. "Sometimes, by analyzing the proteome, we make findings that are not anticipated by the present understanding of the genome. For instance, we find new genes, extended genes, or two genes that are merged together to form one protein." The genome is not always the final word in biological systems. Most recently, with the help of ICAT technology, researchers led by Aebersold have been able to delineate 70% of the *Drosophila* proteome. "It's the first extensive proteome map of a multicellular organism. Because there are so many human homologs in the *Drosophila* proteome, protein analysis of what we've found has a lot to offer for the understanding of processes in human cells but also for the annotation of the fly genome," Aebersold says.

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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

Annual IACUC Conference Ethics and Compliance in Animal Care and Use Programs: *Current Challenges and Future Directions*
MARCH 27-28, 2008
ATLANTA, GA
www.primr.org

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

SHORT COURSE: *Principles and Applications of Immunocytochemistry*
APRIL 5, 2008
SAN DIEGO, CA
This is a technique-oriented course for novice and experienced investigators.
http://immunocytochem.wordpress.com/ for information

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

American Diabetes Association 68th Scientific Sessions
JUNE 6–10, 2008
SAN FRANCISCO, CA
http://scientificsessions.diabetes.org

90th Annual Meeting of the Endocrine Society
JUNE 15–18, 2008
SAN FRANCISCO, CA
www.endo-society.org/apps/Events/Event.cfm?EventID=1253

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

JULY 2008

Trends in Enzymology 2008
JULY 2–5, 2008
ST MALO, FRANCE
Organizers: Susan Miller and Bernard Badet
Website: http://TinE2008.org
E-mail: TinE2008@icsn.cnrs-gif.fr

The XXth International Fibrinogen Workshop
JULY 10–13, 2008
VENICE, ITALY
Sponsored by the International Fibrinogen Research Society
Contact: Dr. Mattia Rocco (mattia.rocco@istge.it)
http://alisf1.univpm.it/XXifw/

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

Fifth International Conference on Biology, Chemistry and Therapeutic Applications of Nitric Oxide
AUGUST 24–28, 2008
BREGENZ, AUSTRIA
http://www.register123.com/event/profile/web/index.cfm?PKwebID=0x9794672ae

Glutathione and Related Thiols in Microorganisms
AUGUST 26–29, 2008
NANCY, FRANCE
Contacts: Jean-Pierre.jacquot@scbiol.uhp-nancy.fr, Pierre.Leroy@pharma.uhp-nancy.fr
https://matar.ciril.fr/THIOL/homephar.php

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

International Conference on Structural Genomics
SEPTEMBER 20–24, 2008
OXFORD, UK
www.spine2.eu/ISGO

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

OCTOBER 2008

17th South East Lipid Research Conference
OCTOBER 3–5, 2008
PINE MOUNTAIN, GA
www.selrc.org

Glycobiology of Human Disorders Symposium
OCTOBER 9–13, 2008
ATLANTA, GA
Organizer: Richard D. Cummings, Emory University
www.asbmb.org/meetings

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

Post Translational Modifications: *Detection & 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

NOVEMBER 2008

2008 Annual Meeting of the Society for Glycobiology
NOVEMBER 12–15, 2008
FORT WORTH, TX
www.glycobiology.org

2008 ASBMB Annual Meeting

Sponsorship Opportunities

Sponsorship opportunities for the 2008 Annual Meeting are still available.

Contact: Jessica Homa, Marketing Manager
jhoma@asbmb.org
American Society for Biochemistry and Molecular Biology
9650 Rockville Pike, Bethesda, MD, 20814
Ph. 301-634-7377
www.asbmb.org

San Diego

April 5-9, 2008 • San Diego, CA