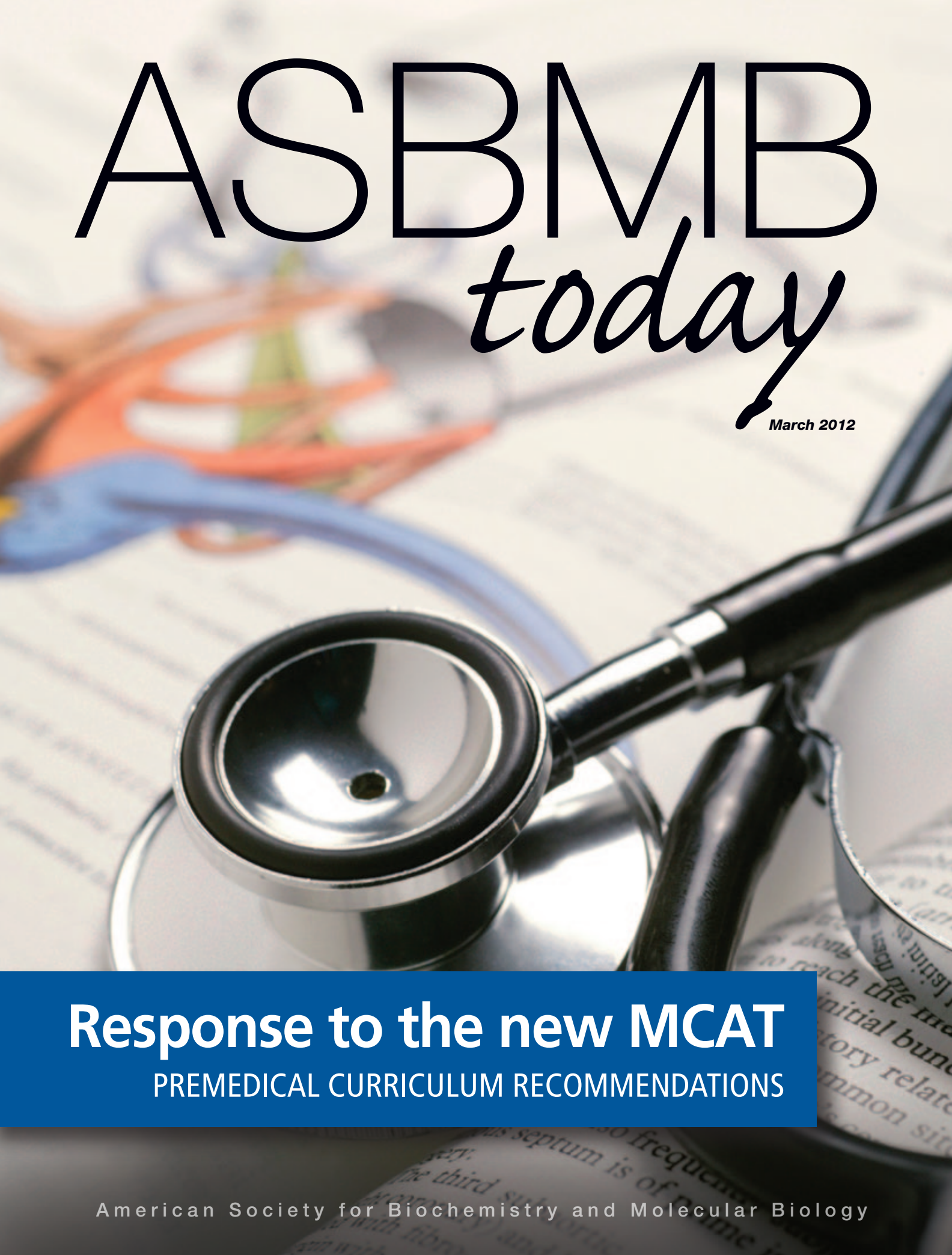
ASBMB today

March 2012



Response to the new MCAT

PREMEDICAL CURRICULUM RECOMMENDATIONS

American Society for Biochemistry and Molecular Biology

Affymetrix® | USB® Products

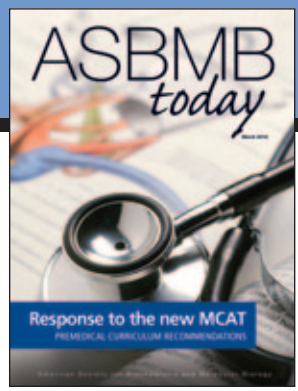
Original ExoSAP-IT reagent means **100%** trusted results.

USB® ExoSAP-IT® reagent is the gold standard for enzymatic PCR cleanup.
Why take chances with imitations?

- 100% sample recovery of PCR products in one step
- Single-tube convenience
- Proprietary buffer formulation for superior performance

Take a closer look at
usb.affymetrix.com/exclusive

contents



MARCH 2012

On the cover: Charles Brenner and Dagmar Ringe offer premedical curriculum recommendations in response to the forthcoming revision of the MCAT.

news

Follow @asbmb at #EB2012

We hope you're planning to tweet and toast with us at the annual meeting. 25

features

Science writer Rajendrani Mukhopadhyay clarifies the record on protein immunoblotting. 34

departments

Find out how students from the University of Delaware keep snagging poster awards. 28

online exclusives

We're pleased to announce that science writer Rajendrani Mukhopadhyay now has a blog.

Follow her quips and queries at www.asbmb.org/asbmbtoday.

ASBMB today

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

ASBMB Today

Angela Hopp *Editor*
ahopp@asbmb.org

Rajendrani Mukhopadhyay
Sr. Science Writer/Editor
rmukhopadhyay@asbmb.org

Erin Salb *Production Coordinator*
esalb@asbmb.org

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

Barbara Gordon *Executive Director*
bgordon@asbmb.org

ASBMB

www.asbmb.org/asbmbtoday

2008 APEX AWARDS FOR PUBLICATION EXCELLENCE

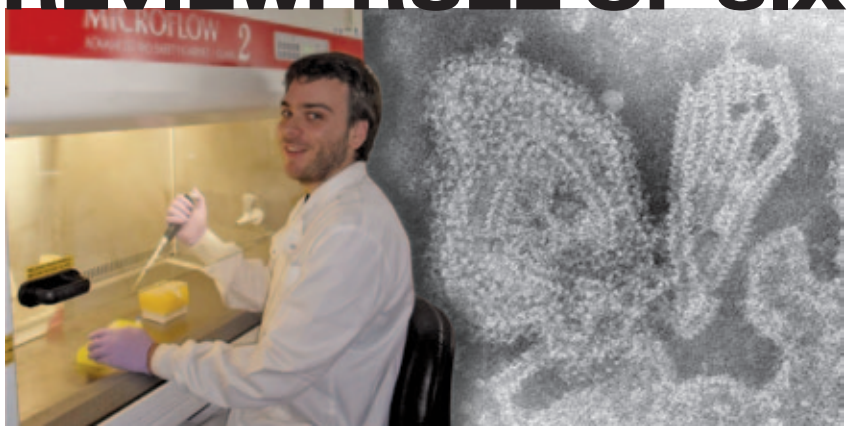
online exclusives

www.asbmb.org/asbmbtoday

Why so blue?

If biochemistry and molecular biology were a color, what would it be? Yes, it might seem like a silly question. But we value your input as we begin strategizing about the future look of ASBMB Today. We hope you'll take our poll at http://bit.ly/zaDr77. So far, a majority of readers say blue is best, but there's still time to vote.

REVIEW: RULE OF 6IX



ASBMB Today contributor Aditi Das looks into Connor Bamford's blog, "Rule of 6ix." Bamford, a Ph.D. student at Queen's University in Belfast, takes on all things virology and has a particular interest in the pathogenesis of mumps, which he's working on at the Centre for Infection and Immunity.

Need clips?

ASBMB Today is always seeking self-starting, volunteer writers to craft news and feature articles for the website. We're looking for storytellers who can identify trends, fairly analyze issues and identify best-suited sources for the stories at hand. For more information or to send a submission query, contact Editor Angela Hopp at ahopp@asbmb.org.

Branching careers in biochemistry

BY SUZANNE PFEFFER

On Jan. 21, the American Society for Biochemistry and Molecular Biology sponsored a wonderful event: 225 graduate students and postdoctoral fellows gathered in Genentech Hall at the University of California at San Francisco to devote a full day to the discussion of career options.

The audience included representatives from Stanford University, UCSF, the University of California at Berkeley, San Jose State University, San Francisco State University and California State University at Fresno. The event was organized by four graduate students — Whitney Johnson and Siggy Nachtergaele of Stanford and David Pincus and Justin Rettenmeier of UCSF — with guidance from two faculty members, ASBMB Council member Jonathan Weissman of UCSF and me.

Graduate students, from left, Whitney Johnson, Siggy Nachtergaele, Justin Rettenmeier and David Pincus organized the ASBMB career symposium in late January at the University of California at San Francisco.

The program consisted of panel discussions on working in biotech; teaching in schools, colleges and museums; starting companies; and practicing patent law. The lunch hour included breakout groups so that students could meet with representatives of the career paths in a more informal setting. Reviews of the event were extremely positive, and several attendees inquired about organizing similar events at their own institutions.

The recipe for organizing this successful career day was really very simple. The organizers identified panelists by emailing faculty members and asking for suggestions and contact information for recent graduates; invited panelists suggested additional participants. By inviting alumni of each of the schools, the program offered a layer of connectivity for all involved. Panelists were pleased to participate and had fun in the process.

A look at the motivating data

The program kicked off with a presentation by Cynthia Fuhrmann, the program director of academic career development at UCSF. Fuhrmann summarized trends in career choices by recent graduates in biochemistry and molecular biology.

After polling Ph.D. students at UCSF, Fuhrmann and her colleagues found that the vast majority of students (92.3 percent) were strongly considering careers in scientific research, and 72 percent of those students were strongly considering a traditional academic career path. On the other hand, when students were asked to pick a single career option, only 44.8 percent chose a traditional academic career path (1). Seventy-one percent of all students surveyed were strongly considering at least one career path not directly involving scientific research. The most popular alternatives were business of science, teaching or education, science policy, and writing.

Fuhrmann and colleagues also found that as students got closer to completing of their degrees, they showed a decreased interest in becoming principal investigators at research-intensive institutions. The gender difference also was striking: 21 percent of women and 39.5 percent of men wanted to pursue this track. Students were concerned about inadequate quality of life or work-life balance, competition, stress, and challenges of research funding. Twenty-five percent wrote that they disliked tasks associated with being a PI, such as grant writing

and project management. By the later years of graduate school, fully one-third of students stated they would choose nonresearch career paths (1).

With so many of our trainees choosing non-PI career paths, we need to embrace the branching career pipeline. This is precisely why the ASBMB has begun to support multiple career workshops across the U.S. each year. In addition to future faculty seminars, universities need to initiate programs that teach skills that will benefit trainees preparing for diverse career paths — skills in oral and written communication, teamwork, networking, project management and leadership. We also need to reward mentors for training students and fellows who move into non-PI positions. For every postdoctoral fellowship and training grant application that asks mentors to document the fates of their former trainees, mentors should be positively rewarded for and proud to document the paths of graduates who have moved on to careers in biotech, teaching, business and law.

LEFT: **Cynthia Fuhrmann is the program director of academic career development within the Office of Career and Professional Development and an assistant professor in biochemistry and biophysics at the University of California at San Francisco.**

RIGHT: **Jonathan Weissman is a member of the ASBMB Council and a professor of cellular and molecular pharmacology and of biochemistry and biophysics at the University of California at San Francisco.**

A little introspection goes a long way

UCSF's Office of Career and Professional Development has developed a worksheet to help students prioritize career-related values, skills and interests (2). During the first hour of the ASBMB workshop, Fuhrmann guided the audience through the worksheet questions, which ask participants to rate how important it is for them to work alone or with others, for example, or have job stability, a high salary or a family-friendly work environment. The worksheet then asks participants to evaluate honestly their knowledge base, research and communication skills, talents in project management, and leadership skills. Finally, interests are evaluated to help clarify which jobs would be most and least satisfying.

Fuhrmann explained how to incorporate these issues into informational interviews with contacts in a given field: "Ask them if their position involves a lot of teamwork, or if their employer is family-friendly." Many of the participants said they appreciated her encouragement for approaches to contact and learn more from alumni about career options.

When students and postdoctoral fellows have expressed to me an interest in teaching, I have tried to steer them toward middle-school and high-school teaching. My bias is that they will have a much broader impact as teachers of younger students; they will have the potential to interest someone in science for the first time and to educate the citizenry about the scientific method and evidence-based conclusions. Given the number of our students who are interested in teaching, we should all reach out to our schools of education and design paths for students to earn joint Ph.D.s and K–12 teaching experience and credentials.

For trainees interested in careers in biotech, more seem to be skipping the option of first completing a postdoctoral fellowship in an academic lab. It has been my impression that one enters biotech at a higher level and with more independence after a postdoctoral stint. Perhaps this is changing, and I welcome guidance from our industrial members in terms of how we should counsel and what we should teach our trainees to best prepare them for careers in industry.

Wholehearted thanks go to Johnson, Nachtergaele, Pincus, Rettenmeier and Weissman for organizing this event and to Fuhrmann for her inspiring presentation. The ASBMB provided lunch and staffing (thank you, Jessica Homa); UCSF, UC-Berkeley and Stanford covered janitorial service expenses. Altogether, 225 students truly benefitted.

Now it's your turn. Each of us would be delighted to help you organize a similar event at your institution. You owe it to your students and fellows. XOXO

ASBMB President Suzanne Pfeffer (pfeffer@stanford.edu) is the Emma Pfeiffer Merner professor of medical sciences and a biochemistry professor at the Stanford University School of Medicine.

REFERENCES

1. Fuhrmann, C.N., Halme, D.G., O'Sullivan, P.S., Lindstaedt, B. Improving graduate education to support a branching career pipeline: recommendations based on a survey of doctoral students in the basic biomedical sciences (2011). CBE Life Sci Educ. 10 (3):239 – 249.
2. The worksheet exercises will be published later this year as part of an online Individual Development Plan (IDP) at ScienceCareers.org. The IDP was co-developed by Fuhrmann and Bill Lindstaedt (UCSF), Philip Clifford (Medical College of Wisconsin) and Jennifer Hobin (Federation of American Societies for Experimental Biology).

Obama's FY13 budget: a mixed bag for biomedical research

BY BENJAMIN CORB

Last month, President Obama released his budget request for fiscal 2013, a plan to fund the federal government from Oct. 1 through Sept. 30, 2013. Budgets in presidential election years are difficult, and the president has identified some priority areas for federal investment while working to cut overall spending levels to decrease future debt and deficits.

National Science Foundation receives a boost from the president in FY13

While the National Institutes of Health received a flat funding request from President Obama for FY13, the National Science Foundation fared far better. Obama proposed a 4.8 percent increase in funding for NSF in FY13, bringing the agency's budget to $7.37 billion.

Total NSF budget
Dollars in millions

FY12	FY13 request	$ change	% change
$7,033	$7,373	$340	4.8%

Of significance to the biomedical community, of course, is the plan for funding the National Institutes of Health. Last year, the NIH saw a modest $200 million increase for FY12 to a level of $30.7 billion. This year, Obama is proposing flat funding, keeping FY13's level at $30.7 billion. The message to the community is mixed. Political realities are such that significant increases to the budget in FY13 are not palatable. The average Joe has had to tighten his belt, and Washington should be doing the same. When viewed through that lens, flat funding can be seen as a relative win. In an environment of cuts, at least the White House understands the nation's biomedical research enterprise should not be a target for cuts.

There is, of course, a flip side. Flat funding, obviously, means no increases. Just as FY12's budget forced a record low success rate, flat funding indicates those painfully low paylines will continue for at least another year. To make matters worse, the biomedical research and development price index — the industry standard for estimating inflation in the field — for 2012 was set at 2.9 percent. Therefore, flat funding actually equates to a cut in NIH funding. Not good.

However, the president has recognized that the funding situation hits new investigators particularly hard. The FY13 budget outlines new grant-management policies to increase the number of new research grants awarded and provide more funding for new investigators.

In late March, the American Society for Biochemistry and Molecular Biology Public Affairs Advisory Committee is sponsoring its biannual Hill Day program, during which members from across the country will deliver a message that underscores the need for federal support for biomedical research not only in FY13 but in years to come. As part of that effort, the PAAC will be calling for budget increases for FY13. Specifically, ASBMB is asking Congress to increase the NIH investment to $32 billion for FY13 and to $35 billion by FY15.

We all know the biomedical enterprise requires two things. First, a sustained investment. Research funding cannot be treated like a roads project; you cannot cut funding one year and increase it the next and expect the scientific community to continue as normal. Cuts have drastic, long-lasting effects. Second, the scientific community needs predictability so it can prepare for lean times, should they come. The ASBMB budget request seeks to address both of those issues.

Obama's budget request is a starting point in a negotiation that likely will last throughout most of the calendar year, and the ASBMB public affairs staff will continue to monitor the situation, continue to inform our membership of changes and continue to provide analysis.

Benjamin Corb (bcorb@asbmb.org) is director of public affairs at ASBMB.

Chronicling women's contributions

Help us build our new online teaching tool highlighting the work of female scientists who have shaped our knowledge of biochemistry and molecular biology and who have otherwise made lasting impressions. Our interactive slideshow features dozens of notable researchers, but we welcome your suggestions for making the resource more robust and comprehensive for classroom use.

See the slideshow at www.asbmb.org/asbmbtoday, and email asbmbtoday@asbmb.org to add other scientists to it.

Judith Klinman

Former ASBMB president

Bettie Sue Masters and Judith S. Bond

Former ASBMB presidents

Susan S. Taylor

Former ASBMB president

Heidi Hamm

Former ASBMB president

Mildred Cohn

First woman to be appointed to the editorial board of the Journal of Biological Chemistry and first woman to become president of ASBMB

Gladys Emerson

Her work led to the isolation and discovery of the nutritional value of vitamin E

Gertrude Elion

Won the 1988 Nobel prize for the first nucleotide-derived anticancer, antiviral drugs

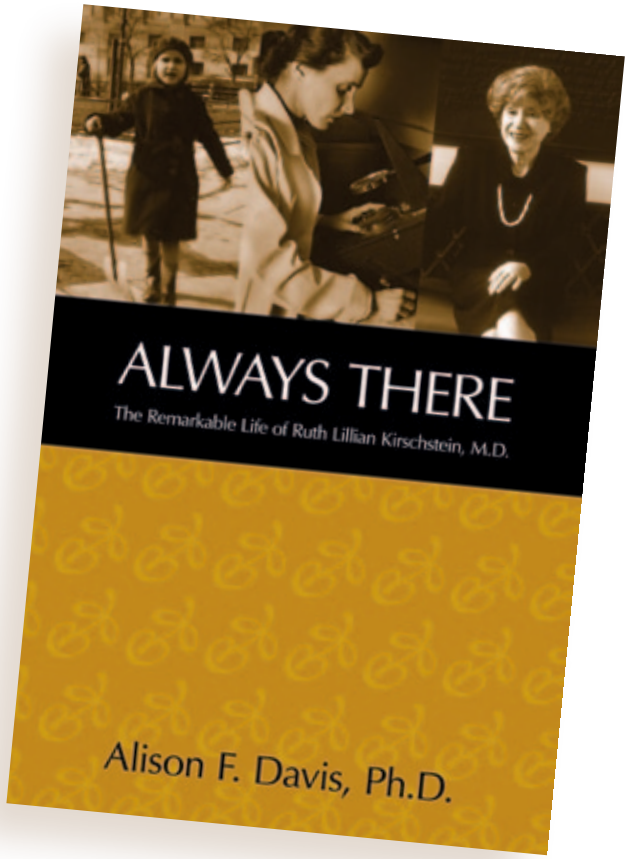
Elizabeth Blackburn and Carol Greider

Nobel prize winners in 2009 for discovery of telomerase

MUST READ

Free e-book tells the life story of revered Ruth Kirschstein

BY ANGELA HOPP



The National Institutes of Health last month released a new biography of Ruth Lillian Kirschstein, the late deputy director of the agency and the longtime director of the National Institute of General Medical Sciences.

The book, "Always There: The Remarkable Life of Ruth Lillian Kirschstein, M.D.," was written by Alison F. Davis, a Washington, D.C.-based scientist-turned-writer, and contains a forward co-authored by Kirschstein's husband, Alan Rabson, and son, Arnold Rabson, both of whom are biomedical researchers.

"So who was this woman, Ruth Lillian Kirschstein? She was the daughter of immigrants, a dedicated student, a direct victim of inequality… a wife, a mother, an astute researcher, a visionary administrator… a member of the esteemed U.S. Institute of Medicine, a passionate mentor and wise counselor, and a charmer of Congressional committees," writes Michael M. Gottesman, the NIH's deputy director for intramural research, in the book's introduction. "Through it all, Ruth was the very embodiment of the NIH spirit while showing the world what a smart, spunky lady could do. Ruth was many things to many people."

Kirschstein was the first woman to head an NIH institute, serving at NIGMS from 1974 to 1993. She played a key role in the development of the Sabin oral vaccine for polio, which in 1971 won her the Department of Health, Education and Welfare's Superior Service Award. She also was a tireless champion for underrepresented minority students, and those efforts were recognized by Congress with the Ruth L. Kirschstein National Research Service Awards, which provide funding for postdoctoral and predoctoral fellows.

Among the many other honors bestowed upon Kirschstein, who died in 2009 at the age of 83, was the American Society for Biochemistry and Molecular Biology's Howard K. Schachman Public Service Award in 2002. Kirschstein donated the award, an antique brass microscope, to the NIH so that it could be displayed permanently on the campus. ASBMB also has an award in Kirschstein's name. It was established to honor an outstanding scientist who has shown a strong commitment to encouraging underrepresented minorities to enter the scientific enterprise and to mentoring those within it.

In a statement about the release of the new biography, Gottesman said, "At a moment in time when professional service to the government is often not given the respect it deserves, the story of Ruth's life and the positive effect she had on public policy, public health and the training of several generations of biomedical researchers should inspire those considering public service and give great satisfaction to those currently serving the nation and the world."

The book is available as a free downloadable PDF and as a free e-book for Nook, iPad and Kindle. Visit www.nih.gov/about/kirschstein to get your copy.

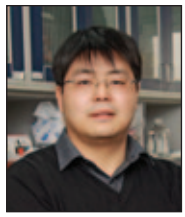
Angela Hopp (ahopp@asbmb.org) is editor of ASBMB Today.

asbmb member update


BOLLINGER


KAHN


DONOGHUE


SHAO


ZHANG


MANN

Bollinger recognized for mentoring record

J. Martin Bollinger Jr., a professor of chemistry and of biochemistry and molecular biology at Pennsylvania State University, was honored by his institution for his track record of coaching junior faculty members. The Howard B. Palmer Mentoring Award, established in 1991 in honor of Palmer, the senior associate dean of Penn State's graduate school in the 1980s, carries a purse of $2,500. Bollinger said he was honored by the award, "but the secret to being an effective mentor lies in the selection of extraordinarily talented colleagues to mentor." He added, "My winning this award is the perfect illustration of this principle!"

Kahn named chief academic officer

C. Ronald Kahn was named the first chief academic officer for the Joslin Diabetes Center, a clinical care and research organization affiliated with Harvard Medical School. In a statement, the center's president and chief executive officer, John L. Brooks, said Kahn "understands the critical importance of our academic mission and our need for actively advancing, attracting and retaining the very best and brightest." Kahn, who will oversee faculty recruitment and promotions, said he also wants to help the center develop a "stronger interface with the other Harvard Medical School affiliates." Kahn is the past president of Joslin and is currently co-chief of the integrative physiology and metabolism section at Joslin and the Mary K. Iacocca professor of medicine at HMS.

Donoghue now provost at UCSD

Daniel J. Donoghue has been named provost of the University of California, San Diego's Sixth College, the newest of the institution's six undergraduate colleges. Donoghue, who had served as vice-chair of the UCSD department of chemistry and biochemistry, took the reins Jan. 1. In a statement, UCSD's executive vice-chancellor for academic affairs, Suresh Subramani, said Donoghue has for years demonstrated his commitment to undergraduate education and service. "He regularly teaches large lower-division courses and is a popular instructor among students," he said. The mission of the Sixth College, established in 2001, is to examine culture and art and how they intersect with science and technology. Donoghue has been with UCSD since 1982.

Shao, Zhang get new HHMI awards

Feng Shao and Hong Zhang, both of the National Institute of Biological Sciences in Beijing, were among 28 recipients from 12 countries who received the Howard Hughes Medical Institute's inaugural International Early Career Scientist awards. All the award recipients trained as graduate students or postdoctoral fellows in the United States. Shao attended graduate school at the University of Michigan and completed his postdoc at the University of California, San Diego, and Harvard Medical School; Zhang attended graduate school at Albert Einstein College of Medicine and completed his postdoc at Harvard Medical School. Today, Shao is an associate investigator and group leader, and Zhang is associate investigator at the NIBS. In a statement, HHMI President Robert Tjian said of the winners, "These are the people who, 10 years from now, we expect will be the scientific leaders in their countries." Shao is taking a combination of biochemical, structural, genetic and cell biological approaches to reveal novel biochemical mechanisms underlying bacterial virulence and host innate immunity. Zhang uses Caenorhabditis elegans as a model to delineate the machinery, regulation and physiological functions of autophagy and to study how protein aggregates are selectively recognized and removed by autophagic machinery.

Mann earns two prestigious prizes

Matthias Mann, director of proteomics and signal transduction department at the Max Planck Institute of Biochemistry in Martinsried, Germany, has won the Louis-Jeantet Foundation's Prize for Medicine, an award for those conducting fundamental biological research expected to be of considerable medical significance. Mann was chosen for his pioneering mass spectrometry work. The award ceremony will be held in April in Geneva. The first part of the prize is 700,000 Swiss francs, or about $777,000, for further research. The second part, about $82,000, is for personal use. In December, Mann was one of 11 researchers who received the 2012 Leibniz Prize, the largest German research prize at 2.5 million euros, bestowed by the Joint Committee of the German Research Foundation in Bonn.

ASBMB-MERCK AWARD

Wang lauded as 'one of the most highly original, bold and creative scientists'

BY GEOFF HUNT

Xiaodong Wang, a former Howard Hughes Medical Institute investigator now at the National Institute of Biological Sciences in Beijing, has been named the winner of the American Society for Biochemistry and Molecular Biology's Merck Award.

Wang received the award for his discoveries concerning the mitochondrial basis of apoptosis, detailing the sequence of steps involved and showing that both effectors and inhibitors of programmed cell death are housed in this organelle.

Professor Xiao-Fan Wang from the Duke University Medical Center hailed Xiaodong Wang's lab for "identifying almost all the major cellular components that mediate the apoptotic signal."

By working out the steps of the apoptotic pathway and identifying the key players, Wang also generated a plethora of drug targets currently being explored by several pharmaceutical companies, including Joyant Pharmaceuticals, which he co-founded in 2005.

For Wang, who recently moved to China to serve as director of the national institute in Beijing, the award carries a special meaning. "It is a great feeling to know that although I am gone, I am not forgotten," he said.

Wang came to the United States from China in 1985 to pursue his Ph.D. in biochemistry at the University of Texas Southwestern Medical Center at Dallas. After graduating in 1991, he stayed on in the lab of Nobel laureates Mike Brown and Joe Goldstein and worked on sterol regulation of gene expression. A brief appointment at Emory University was not enough to keep Wang from returning in 1996 to UT-Southwestern, where he worked until moving this past year back to China.

In a joint nomination, Brown and Goldstein praised Wang as "one of the most highly original, bold and creative scientists in the world today." They continued: "His influence and impact on the field of biochemistry and molecular biology have been wide and deep."

Wang will receive his award during the Experimental Biology 2012 conference in San Diego, where he will deliver an award lecture. The presentation will take place at 9:05 a.m. April 23 in the San Diego Convention Center.

About the award

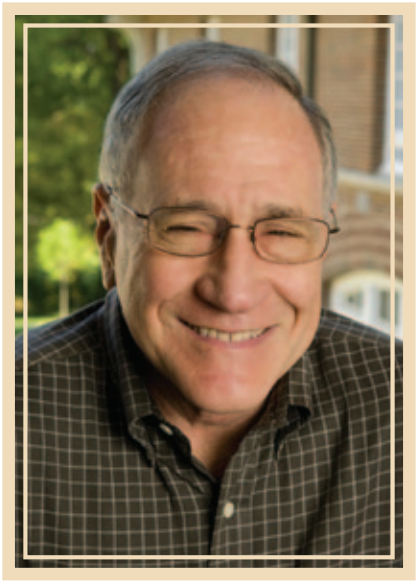
The ASBMB-Merck Award recognizes outstanding contributions to research in biochemistry and molecular biology. It provides a plaque and a $5,000 purse, and it covers transportation and expenses of the recipient and spouse to attend the ASBMB annual meeting and present a lecture.

ASBMB DELANO AWARD

Honig honored for his contributions through computational methods

BY GEOFF HUNT

The American Society for Biochemistry and Molecular Biology has named Barry Honig, professor of biochemistry and molecular biophysics at Columbia University College of Physicians and Surgeons and a Howard Hughes Medical Institute investigator, the winner of the society's 2012 DeLano Award for Computational Biosciences.



The 2011 DeLano Award recipient, Axel Brunger of Stanford University, stated his case in nominating Honig for the award succinctly: "Few computational scientists had as much of an impact as Dr. Honig on the understanding of macromolecular interactions in biology."

Honig said he was delighted that the society "has chosen to recognize, with the Delano Prize, the increasingly important role of computational research in modern biosciences." He continued, "I am honored to be a recipient of the award and am thankful to the community of people who were close to Warren DeLano for the vision and initiative that led to the establishment of the award."

Honig's work has focused on understanding how proteins take advantage of electrostatics, the positive and negative electric fields on their surface, to fold into three-dimensional structures and bind to other proteins or cell membranes. "Barry Honig has taught many of us, including myself," said John Kuriyan from the University of California, Berkeley, "to appreciate the way in which the shapes of proteins influence the electric fields generated by the charges within them."

Based on his studies of protein electrostatics, Honig and his colleagues developed software that has become a mainstay used to analyze protein structures. According to Andrew McCammon, a professor at the University of California, San Diego, "these methods have been used by many hundreds of research groups to assess numerous studies of the activities of biopolymers, resulting in the now-familiar red-to-blue surfaces of proteins and other molecules on the covers and in the pages of scientific magazines worldwide."

During his education and training, Honig bounced back and forth between the United States and Israel. He did his undergraduate and master's work in the U.S. before decamping for Israel to obtain his Ph.D. in chemical physics from the Weizmann Institute of Science. He carried out his research at Tel Aviv University. Again crossing the Atlantic, Honig did postdoctoral fellowships at Harvard University and Columbia University before returning to Israel in 1973 to accept a position at the Hebrew University in Jerusalem. After six years, he returned to America, spending two years at the University of Illinois and then moving back in 1981 to Columbia, where he seems finally to have settled. In 2000, he was named an HHMI investigator.

Honig will receive his award during the Experimental Biology 2012 conference in San Diego, where he will deliver an award lecture. The presentation will take place at 8:30 a.m. April 24 in the San Diego Convention Center.

About the award

The DeLano Award for Computational Biosciences was established by family, friends and colleagues to honor the legacy of Warren L. DeLano. The award is given to a scientist for the most accessible and innovative development or application of computer technology to enhance research in the life sciences at the molecular level. The contribution should include two key elements — more productive use of computers to accelerate and facilitate research and ready access of these programs for the scientific community. The award consists of a plaque, a $3,000 cash award and travel expenses for the recipient to attend the ASBMB annual meeting to present a lecture.

AVANTI YOUNG INVESTIGATOR AWARD

Espenshade's work called 'brilliantly conceived and flawlessly executed'

BY GEOFF HUNT

The American Society for Biochemistry and Molecular Biology has named Peter Espenshade, associate professor of cell biology at Johns Hopkins University, the winner of the society's Avanti Young Investigator Award in Lipid Research.

"It is an honor to receive the 2012 ASBMB Avanti Young Investigator Award and to have the hard work of the students and postdocs in my lab acknowledged," said Espenshade in response to receiving the award in recognition of his work investigating how cells sense and respond to changes in the supply of essential molecules.

According to Peter Devreotes from Johns Hopkins University, the implications of Espenshade's work are "critical to research into the nature and prevention of cardiovascular disease and stroke." Moreover, his multifaceted research on how cells regulate both oxygen levels and production of cholesterol "for the first time united the fields of sterol synthesis and oxygen regulation," said Nobel laureate Michael Brown, with whom Espenshade trained as a postdoctoral fellow. "His work is original, brilliantly conceived and flawlessly executed."

Randy Hampton, professor of biology at the University of California, San Diego, agreed. "Espenshade has an incredible sense of where to look to find really fascinating and important things – and what to do to turn them into great stories and lines of inquiry."

After graduating summa cum laude from Princeton University, Espenshade completed his Ph.D. in biology at the Massachusetts Institute of Technology in 1997. During his postdoctoral fellowship with Brown and fellow Nobel laureate Joseph Goldstein at the University of Texas Southwestern Medical Center at Dallas, Espenshade used mammalian cell systems to decipher pathways involved in environmental sensing, in particular focusing on cholesterol homeostasis.

In 2003, he moved to his current position at Johns Hopkins, where he expanded his research to incorporate the fission yeast Schizosaccharomyces pombe as a model system. Espenshade's ability to "exploit the strengths of both fungal and mammalian model systems to make paradigm-shifting discoveries" led Devreotes to nominate Espenshade for the award. "I have no doubt that his future achievements will be even more prominent."

Espenshade will receive his award during the Experimental Biology 2012 conference in San Diego, where he will deliver an award lecture. The presentation will take place at 9:55 a.m. April 23 in the San Diego Convention Center.

Geoff Hunt (ghunt@asbmb.org) is ASBMB's public outreach coordinator.

About the award

The Avanti Young Investigator Award in Lipid Research, established by ASBMB's Lipid Research Division, recognizes outstanding research contributions in the area of lipids by young investigators with no more than 15 years of experience since receiving their degrees (Ph.D. or M.D.). The award consists of a plaque, $2,000, and transportation and expenses to present a lecture at the 2012 ASBMB annual meeting.

Response to the new MCAT

ASBMB premedical curriculum recommendations

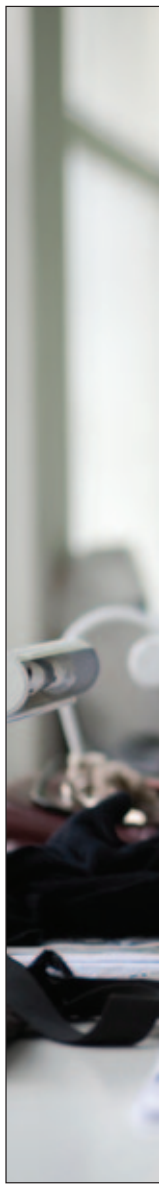
BY CHARLES BRENNER AND DAGMAR RINGE

EDITOR'S NOTE: At the December Council meeting of the American Society for Biochemistry and Molecular Biology, President Suzanne Pfeffer tasked Charles Brenner with developing premedical curriculum recommendations consistent with the Medical College Admission Test, a revision of which will be rolled out in 2015. Brenner is the Roy J. Carver chair and head of biochemistry at the University of Iowa, a department responsible for teaching undergraduate, graduate, medical and health professional students. After investigating premedical education at his own institution and several others, Brenner turned to Dagmar Ringe, the Harold and Bernice Davis professor of aging and neurodegenerative disease in the departments of chemistry and biochemistry at Brandeis University, to develop recommendations. Ringe also is an organic chemistry and biochemistry textbook author and a former director of the organic chemistry laboratory course at the Massachusetts Institute of Technology. ASBMB encourages your feedback, critique and/or support for the recommendations presented here. Please weigh in at www.asbmb.org/asbmbtoday.

Many college students plan their curricula based on medical-school admissions requirements. Enrollment in undergraduate biology, chemistry, physics and calculus courses contributes to science, technology, engineering and mathematics (STEM) literacy even if many premedical students turn to fields other than medicine. The practice of medicine and the education of physicians continue to evolve. In 2008, the American Association of Medical Colleges established the MR5 Committee to revise the MCAT, which was last revised in content areas in 1991, 10 years before the first human genome sequence was available (1–3).

The MR5 Committee has made recommendations that will result in testing of core concepts in biochemistry and social and behavioral sciences, and it also will test critical thinking in ethics and multicultural studies. In preparation for the revised MCAT to be administered in 2015, many colleges of medicine are changing course requirements for students who will begin medical school in 2016 and beyond.

Enrollment in college STEM and other courses is expected to shift. Universities may need to provide resources to courses on subjects that will be tested in the revised MCAT. Moreover, disciplines already represented in the MCAT may be influenced by the MR5 Committee's recommendations. For example, because biomedical research and practice depend increasingly on statistics, bioinformatics and imaging, the mathematics and physics background provided to premedical students should emphasize these subject areas. Leaders in mathematics and physics will need to determine what material is most germane to future physicians. Similarly, social and behavioral scientists are encouraged to engage in the MR5 process to provide core concepts to premedical students.



The American Society for Biochemistry and Molecular Biology represents thousands of faculty members who teach and conduct research in departments of biology, chemistry, biochemistry and molecular biology. We offer four recommendations for restructuring premedical curricula. If these recommendations are enacted, millions of college students will acquire an education that will improve biomedical literacy and better prepare students for the field of medicine in this genomic, proteomic and metabolomic era. Importantly, these recommendations leave time for students to take classes in social and behavioral sciences and in the liberal arts, which are necessary for the revised MCAT, for medical practice, and for an informed, sensitive citizenry (4).

1. The introductory year of biology should be refreshed (if it hasn't been already) to prepare students in cellular and molecular biology up to and including fundamentals of genetics and biological information transfer.
2. The traditional, two-year sequence of general and organic chemistry should be streamlined to a single year of life-oriented chemistry that focuses on bonding and reactivity of molecules containing carbon, oxygen, phosphorus, sulfur and nitrogen.
3. A one-semester biochemistry course should be required and a two-semester biochemistry

course recommended for premedical students. The material must broadly introduce macromolecular structure/function and cellular metabolism.

4. A single biology, chemistry or biochemistry laboratory course emphasizing research methods and statistics should be required. The content is expected to vary with the department offering the course. For example, a biology laboratory might utilize fluorescent reporters of gene function. A chemistry laboratory might consist of the traditional organic chemistry material or a bioanalytical unit that focuses on quantifying carbohydrate and lipid metabolites. A biochemistry laboratory might characterize enzymes. Each of these methods courses would be expected to cover statistics and data analysis.

We note that a biochemistry course is not offered at every school in which premedical students are enrolled. However, the extensive content survey conducted by the MR5 Committee identified biochemistry as the discipline most important for mastery of the medical school curricula of the future (1). In this age in which gene mutations and metabolic dysregulation are increasingly found to underlie human diseases and differential responses to treatments, enrollment in two semesters of biochemistry is expected to provide students with optimal undergraduate preparation for medical education and training. In turn, better prepared medical students will be able to handle a modernized medical curriculum that will increasingly teach genomics and integrate advanced biochemical concepts into the diagnosis and personalized treatment of disease.

We have initiated conversations with colleagues in departments of biology, chemistry and biochemistry nationwide. Many departments of biology are prepared for these recommended changes because introductory biology is now a molecular course and because capacity exists for increased enrollment in biology laboratory courses.

Chemistry departments, long accustomed to high nonmajor enrollment in general chemistry, organic chemistry and organic chemistry laboratory, are encouraged to make significant changes to create a nonmajor track in chemistry for life scientists. Though the first semester of general chemistry may be fairly similar to that of a new yearlong sequence in life-oriented chemistry, it will need to get to carbon and carbonyl chemistry more quickly. Moreover, the first semester of organic chemistry, as it is typically taught, does not cover the right material for the new yearlong sequence. Less time will be needed for alkanes, alkenes and alkynes. There will need to be a much earlier introduction to esters and amides. The yearlong chemistry sequence does not necessarily have to put together a macromolecule, though, because biochemistry will do that.

There is a need and opportunity for new textbooks to support life-oriented chemistry. There is also potentially some relief to departments that have been offering organic chemistry laboratory to large numbers of nonmajors. Such students may be distributed into biology or biochemistry labs or offered different chemistry labs, such as bioanalytical chemistry.

At some institutions, biochemistry will be taught by the most chemically oriented member of the biology department or the most biologically oriented member of the chemistry department. This should work fine, so long as the core concepts in macromolecular structure and func-

tion, biological information transfer, enzymatic catalysis, metabolism, and small-molecule signaling are conveyed. We believe that biologists, chemists and biochemists should work together to refine and improve premedical education and also engage with mathematicians, physicists and colleagues in the social sciences, brain sciences and humanities to help prepare the next generation of physicians.

Premedical course recommendations are minima, not maxima. Those physicians who specialize in family practice or end-of-life care may benefit from much more coursework in psychology than is required to take the MCAT. Those who specialize in nuclear medicine might benefit from a triple major in chemistry, biochemistry and physics. The key in developing premedical recommendations is to ensure that a broad range of core concepts is covered and evaluated at the gateway to medical school.

Finally, it has not escaped our attention that some chemistry departments will not be able to provide the resources right away for a nonmajor track that is distinct from course offerings to majors. We provide a potential solution. If a chemistry department were to move to a 1:2:1 sequence for their majors (i.e., one semester of general chemistry, followed by two semesters of organic chemistry, followed by one semester of advanced inorganic chemistry), then students on the life-science track could substitute a semester of biochemistry for the fourth semester of the majors' sequence. However, a redesigned year of life-oriented chemistry that will get to the key carbonyl reactions (e.g., Michael addition, Claisen condensation and aldol condensation) sooner and allow time for a year of biochemistry is expected to provide great benefits to the next generation of biomedical students.

FREQUENTLY ASKED QUESTIONS

Is your recommendation of one year of life-oriented chemistry equivalent to the first semester of general chemistry plus the first semester of organic chemistry? No. Parts of organic chemistry would be incorporated into the first semester of the new two-semester sequence for biomedical students.

Is there an existing book that teaches life-oriented chemistry in the way you envision this course? No, but we think that there is an exceptional opportunity for people to write new chemistry textbooks that would satisfy this need.

Does the shortened time on organic chemistry material mean that the course will focus more on memorization and less on reactivity and reaction mechanisms? No. Ideally, this course would meet the needs of biochemistry majors and could either be required or elective for other majors, such as biologists and biomedical engineers. The core competencies from this course should include a strong understanding of chemical reactivity of the classes of compounds encountered in biological systems. It shouldn't be dumbed-down or rote-oriented organic chemistry.

Do you really think that all college freshmen nationwide are going to be ready for this course? No, but a substantial fraction of biomedically oriented students, especially those who ultimately matriculate to medical schools, come in with the right background. Students who aren't ready for this course can certainly take the first semester of general chemistry and then either continue with the chemistry majors' track or proceed to the two semesters of life-oriented chemistry.

Where do these recommendations stand? Ultimately, colleges and universities that teach premedical students need to decide how to respond to the upcoming changes in the MCAT. We believe that those schools that evolve their coursework and premedical recommendations will benefit by attracting the best and most informed students, by gaining greater integration between departments, and by producing students who are well prepared for graduate and professional schools. We look forward to the dialogue with our colleagues locally and nationally.

REFERENCES

1. AAMC. Summary of the 2009 MR5 Science Content Survey of Medical School Institutions (2010). www.aamc.org/students/download/263140/data/msnsreport.pdf.
2. Alpern, R.J., Long, S., Åkerfeldt, K., Ares, M., Bond, J., Dalley, A.F., de Paula, J., Dienstag, J.L., Fishleder, A.J., Friedlander, M.J., Gibbons, G.H., Hilborn, R.C., Holmes, J.H., Insel, P.A., Kirk, L.M., Korf, B., Kumar, V., Marantz, P.R., Neuhauser, C.M., Petsko, G., Siegel, R., & Silverthorn, D. AAMC-HHMI Scientific Foundations for Future Physicians (2009). www.hhmi.org/grants/pdf/08-209_AAMC-HHMI_report.pdf.
3. Alpern, R. J., Belitsky, R., & Long, S. Competencies in premedical and medical education: the AAMC-HHMI report (2011). *Perspectives in Biology and Medicine*, **54**(1), 30–35. doi:10.1353/pbm.2011.0001.
4. Dienstag, J. L. The Medical College Admission Test — toward a new balance (2011). *The New England Journal of Medicine*, **365**(21), 1955–1957. doi:10.1056/NEJMp1110171.

ENDORSEMENTS

Gregory Petsko, past president of the ASBMB and professor of biochemistry and chemistry at Brandeis University

Suzanne Pfeffer, president of the ASBMB and professor of biochemistry at Stanford University

Jeremy Berg, president-elect of the ASBMB and associate senior vice-chancellor for science strategy and planning at the University of Pittsburgh

Arthur Haas, past president of the Association of Graduate and Medical Departments of Biochemistry and chair of biochemistry and molecular biology at the Louisiana State University Health Sciences Center

Jane Azizkhan-Clifford, president of the Association of Graduate and Medical Departments of Biochemistry and associate dean for medical student research and chair of biochemistry at Drexel University

Amnon Kohen, professor of chemistry at the University of Iowa

Dale Mierke, professor of chemistry at Dartmouth College

Bernd Fritzsch, chair of biology at the University of Iowa

ComBio2012

Adelaide Convention Centre
Adelaide, South Australia

23 to 27 September 2012

Early Registration and Abstract Deadline:
Friday, 22 June 2012

Incorporating the annual meetings of:

- Australian Society for Biochemistry and Molecular Biology
- Australian Society of Plant Scientists
- Australia and New Zealand Society for Cell and Developmental Biology
- New Zealand Society for Biochemistry and Molecular Biology
- New Zealand Society of Plant Biologists
- Australasian Microarray & Associated Technologies Association

and the inaugural meeting of:

- Australasian Plant Pathology Society - Molecular and Physiological Plant Pathology Special Interest Group

Plenary Speakers

Confirmed Plenary Speakers at this time:

- **Raymond J. Deshaies** Howard Hughes Medical Institute, California Institute of Technology, USA
- **Richard Dixon** Samuel Roberts Noble Foundation, OK, USA
- **Seth Grant** Sanger Institute, UK
- **Jeff Hasty** University of California San Diego, USA
- **James Hurley** NIH, Bethesda, USA
- **Michael Karin** University of California San Diego, USA
- **Robin Lovell-Badge** National Institute for Medical Research, London, UK
- **Chris Marshall** Institute of Cancer Research, London, UK
- **Susan McCouch** Cornell University, Ithica, USA
- **Anne Osbourn** John Innes Centre, Norwich, UK
- **Peter Reich** University of Minnesota, USA
- **Dale Sanders** John Innes Centre, Norwich, UK
- **John D Scott** Howard Hughes Medical Institute, University of Washington, Seattle, USA

Further information:

Conference: Stuart Pitson
stuart.pitson@health.sa.gov.au

Registration/Exhibition: Sally Jay
combio@asbmb.org.au

www.asbmb.org.au/combio2012




Meet Steven P. Briggs, a new associate editor for Molecular & Cellular Proteomics

BY RAJENDRANI MUKHOPADHYAY

In 2011, Steven P. Briggs at the University of California, San Diego, became an associate editor for Molecular & Cellular Proteomics. Briggs' research has a two-pronged approach: One focuses on the innate immune system of plants, while the other delves into mass spectrometry technology so that researchers can see directly protein dynamics and interactions on a large scale. In 2007, Briggs was named a fellow of the American Association for the Advancement of Science for his work on plant–microbe interactions and functional genomics. He is also a member of the National Academy of Sciences and spent the first half of his career in industry. Briggs spoke with ASBMB Today about his research interests, his thoughts on MCP and his career path. Below are edited excerpts from the interview.

Q: *Tell us what your group works on.*

Briggs: I have a scientific focus and a technical focus. The scientific focus is on plant immunity. Plants have immune systems, just like everything else, and it's what makes agriculture possible. Plants can't use behavior to escape pathogens and pests, so they must rely on inherited immunity that has to work under all kinds of environmental conditions, such as heat, cold and drought. In contrast, animals have both innate and adaptive immune systems. When I started my career, the field was called plant pathology, and we didn't understand anything about the plant immune system. We just knew that we could breed plants for resistance— that was a key goal of agriculture for seed improvement. Over the course of my career, the plant science community has discovered the basis for plant immunity and elucidated a lot of detail about how it works. I started out in genetics, then genomics and now proteomics, because in the end, we're trying to understand what molecules are involved and how they work. Plant biology is an extremely exciting area of science and proteomic research! I encourage the biomedical community to take a fresh look at plant biology.

The technical focus of the lab is, not surprisingly, proteomics. We do discovery mass spectrometry where we don't know what the proteins are that we're looking for. So we try to see everything we can and pick out the proteins that are changing in response to immune activation or are co-precipitating with a protein that we already know is important. We also work on sample prep, which is an area I think needs the most work and offers the most opportunity for progress in proteomics. Bioinformatics is another focus of the lab. Our goal is to make biology quantitative, because a fundamental goal of biology is to know the absolute number of molecules in a cell. Once you know that, you can compare your experiment with anybody else's.

Q: *What has been your career trajectory?*

Briggs: I did my graduate work at Michigan State University in electron spin resonance spectroscopy. I was studying a molecule involved in plant immunity that affected lipid fluidity in the plasma membrane. I went into industry right out of graduate school and helped start up the biotechnology program for the largest seed company

> *"I went into industry right out of graduate school and helped start up the biotechnology program for the largest seed company in the world."*

in the world, Pioneer Hi-Bred International. It's now owned by DuPont. The focus was on maize as a crop as well as a model system. I wasn't trained as a geneticist, so I had to learn genetics! As part of that, I got involved with folks at Cold Spring Harbor Laboratory to set up a plant science program that would build on the pioneering genetics research of Barbara McClintock, who was still active at the time. I moved to Cold Spring Harbor for three years to help get the plant group started as well as to improve my own training in maize genetics and molecular biology. At that time, in the 1980s, molecular biology was still pretty new. I then went back to Pioneer. In the late 1990s, Novartis decided to get into genomics by setting up two new institutes, one focused on drug development and one focused on agriculture. I set up the Torrey Mesa Research Institute in La Jolla in 1998. After a few years, we spun parts of the company out, and I moved over to UCSD [in 2004].

Q: *How do you view MCP and proteomics?*

Briggs: I was attracted to contributing to the journal because of its leadership position in proteomics. It's an interesting time, because there aren't many journals that are just about a technical approach, such as proteomics. They are mostly about a scientific topic. I think that proteomics is unusual because it's probably the most difficult approach to biological science to practice. Because of that, it really hasn't had the wide adoption that microarrays and next-generation sequencing have had. Proteomics has been around for a while, but it's still a craft.

Q: *What do you look for in manuscripts?*

Briggs: There are two types of papers. Some of them are about technical improvement, but most of them are applications. For the last 10 years, much of the application has been about demonstrations, the kind that say, "We can measure these molecules." I am no longer accepting papers like that. I look for papers that enable us to draw new conclusions about biology from proteomic measurements.

Q: *What are your hobbies?*

Briggs: Skydiving— I've been doing it for 32 years. It was something I always wanted to do since I was a kid, but I grew up in Vermont, and there was nothing like it in Vermont at that time. My first opportunity was in graduate school, because there was a skydiving club. One of the genres of skydiving is making large formations. Somebody will organize an event where an invited group of divers will try to build a large formation. A few months ago, we built a 200-person formation.… We were diving from nine aircraft in formation, and that alone was pretty impressive to see. You only have one minute to make a formation— you have to get everybody out of the airplane, dive down to the formation and get into the assigned positions. Then everybody has to fly far away from each other so when the parachutes open, they don't run into each other. You should try it!

Q: *What is your motto in life?*

Briggs: Work hard and be nice. XXXX

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the senior science writer for ASBMB Today and the technical editor for the Journal of Biological Chemistry.

Meet Jerry Hart

He doesn't break a sweat juggling his duties as an associate editor for both the JBC and MCP — all while leading a department at Johns Hopkins University School of Medicine

Gerald "Jerry" W. Hart is an American Society for Biochemistry and Molecular Biology journal regular, having served as an associate editor for Molecular & Cellular Proteomics since 2008, and last year he agreed to put on yet another hat for the society and for science by joining the ranks of the Journal of Biological Chemistry associate editors. Hart, director of the biological chemistry department at the Johns Hopkins University School of Medicine, has published 54 papers in the JBC. Here he offers some insights on his relationship with ASBMB journals and his work at his home institution.

Q: *Would you briefly explain what your research group is studying?*

Hart: In the early 1980s, we discovered that the textbooks were all wrong about protein glycosylation by finding that many proteins within the nucleus and cytoplasm are indeed glycosylated. In the past 27 years, we have found that this cycling sugar modification of proteins — called O-linked N-acetylglucosamine, or O-GlcNAc — is nearly as common as protein phosphorylation and often competes with it at the same or proximal sites on proteins to regulate nearly every cellular process in response to nutrients and stress. O-GlcNAc not only plays a key role in signaling, in transcription and in cytoskeletal functions, but it also underlies glucose toxicity in diabetes, is important in neurodegenerative diseases and is important in cancer etiology. Our research is focused on elucidating the molecular functions of this ubiquitous and essential post-translational modification.

Q: *Tell us about your academic background and research training.*

Hart: I earned my Ph.D. in developmental biology from Kansas State University, working with professor Gary W. Conrad. Gary was a postdoctoral fellow with Albert Dorfman, an early pioneer in the field of proteoglycans. Gary was a fantastic mentor who not only demanded rigor in science but also inspired everyone with his enthusiasm and keen intellect. Gary is one of the best teachers I've ever known.

Q: *Did anything occur, in a milestone sort of way, that made you choose science as a career?*

Hart: I basically was born wanting to be a scientist. Since my earliest days, I knew that I wanted to be a scientist. My mother, in particular, encouraged this by allowing me to have a "laboratory" in my bedroom even when I was still fairly young.

Q: *What was your doctoral research?*

Hart: I studied the molecular basis for the development of corneal transparency. In particular, I focused on the roles of sulfated proteoglycans, such as keratin sulfate type I, and on chondroitin sulfates in controlling collagen organization and optical properties of the tissue.

Q: *And with whom did you train as a postdoc, and what was your work there?*

Hart: From June 1977 to July 1979, I was a Jane Coffin Childs postdoctoral fellow in the laboratory of professor William J. Lennarz in the physiological chemistry department (now biological chemistry) at Johns Hopkins

University School of Medicine. There, I showed that keratin sulfate type I was made via the N-linked glycosylation pathway via oligosaccharyl transferase, and I experimentally established that the sequon Asn-X-Ser(Thr) is the minimal recognition sequence for N-linked glycosylation. I joined the faculty as an assistant professor in the same department in July 1979.

Q: *During grad school and/or postdoc, did something especially impress you to choose the path you've blazed in research?*

Hart: Yes, my work on proteoglycans introduced me to the wonderful complexity and biological importance of glycans. Across the hall at KSU, Dr. Clayton Buck's laboratory was doing pioneering work on the roles of glycans in cancer. In thinking about what molecules on the surfaces of cells had both the plasticity and molecular complexity to explain developmental programs, I knew it had to be the glycans. Growing up in Kansas, I had never even heard of Johns Hopkins. Dr. Buck showed me a review article in Science written by Bill Lennarz on N-linked glycans and suggested that I consider his laboratory. It was pure luck that I went there. Even knowing what I know today about the field of glycobiology, I would still pick the same laboratory. It was a great experience.

Q: *You have published 54 articles in the JBC. What's the draw for you?*

Hart: As a graduate student, a postdoctoral fellow and a faculty member at Johns Hopkins, JBC was the place to publish. First, unlike the news magazines like Science or Nature, you always get your paper reviewed by scientific peers who are qualified to evaluate the science. Instead of peer review, for the most part, these other magazines hire nonscientists as gateway keepers who decide if a paper is trendy or not before it is peer-reviewed. In addition, JBC was founded by the chair of pharmacology at Johns Hopkins, John Jacob Abel, in 1905. Professor Abel hired our first department chair to found our department in 1908. Our department has always had strong ties to JBC and to ASBMB. Besides, JBC is clearly the best biochemistry journal there is. Why would you want to publish anywhere else?

Q: *What does MCP offer that wasn't available before its creation?*

Hart: MCP is the premier journal in the field of proteomics for very good reasons. Not only does MCP require proteomics data to be of good quality and to be held to a high standard of rigor, but MCP also requires authors to demonstrate clearly the biological or biochemical significance of their data. The proteomic data must advance the field in a significant way and not just serve as an archive of large data sets. This focus on rigor and on the biological significance of the study sets MCP apart and above other proteomic journals.

Q: *So now that you're an associate editor for both MCP and the JBC, how do you manage to juggle your responsibilities?*

Hart: I have been doing both now for over six months, and it is not a problem. I have a lot of experience as an editor. In 1989, I founded the journal Glycobiology, now the leading specialty journal in this field, and I ran the journal for 12 years. During that same time, I also served on the editorial board of JBC for about 16 years. The BenchPress manuscript-tracking system really makes the associate editor job much easier.

Q: *What do you do outside of the lab? Hobbies?*

Hart: I am an avid swimmer. Beyond that, I can't think of anything I'd rather do than research. It is my hobby and my job.

Q: *For scientists in training, do you have any words of wisdom or a favorite motto?*

Hart: I tell my students: You should not go into science unless you love it. If you want to make money, go sell shoes or something. On the other hand, we scientists have the best job on the planet! We get paid to do what we love, to test our weird ideas, and we get to travel all over the world to discuss our ideas with other like-minded people. It doesn't get any better than that! XXX

Meet Paul E. Fraser, a new associate editor for the Journal of Biological Chemistry

BY RAJENDRANI MUKHOPADHYAY

In 2011, Paul E. Fraser at the University of Toronto became an associate editor for the Journal of Biological Chemistry. Before becoming an associate editor, Fraser served as an editorial board member for the JBC for more than eight years. An expert in neurodegenerative diseases, Fraser focuses on the biochemistry and biophysics of amyloid plaques and their connections to Alzheimer's disease. Fraser has organized several conferences on amyloids and served on the editorial board of Biochemica Biophysica Acta. Fraser spoke with ASBMB Today about his research interests, his thoughts on the JBC and his career path. Below are edited excerpts from the interview.

Q: *Tell us what your group works on.*

Fraser: The focus of our work has been largely related to Alzheimer's disease. We actually have a number of different avenues, like looking at the biochemistry and cell biology of gamma-secretase and presenilins. Back in 1995, I was privileged to be part of the team led by Peter St. George-Hyslop and Johanna Rohmmens that discovered and characterized presenilins. We had pulled out this interesting protein that turned out to be the major disease-causing protein in familial Alzheimer's disease. Its gene was on chromosome 14. We later named the protein and its family members presenilins. Presenilins were considered to be the proteases responsible for chopping up the amyloid precursor protein. Mutations in the presenilins altered the proteolysis of APP.* When you have mutations in presenilins, the gamma-secretase becomes dysfunctional, APP tends to go astray and the disease accelerates. A lot of us are focusing on new diagnostics, whether it's imaging tech-

> *"These studies have pulled out half a dozen really interesting hits that are related to sporadic Alzheimer's disease."*

niques or biomarkers, so we can pick up people at risk for Alzheimer's disease. We are looking at new proteins or genes that have been highlighted by genome-wide association studies [an approach that involves quickly scanning markers across sets of DNA, or genomes, from many people to find genetic variations in a disease]. These studies have pulled out half a dozen really interesting hits that are related to sporadic Alzheimer's disease. We do a lot of basic protein chemistry as well as animal modeling. We're not really techniques people, and my lab is more interested in focusing on the disease, so whatever tools we need, we work with them.

Q: *What has been your career trajectory?*

Fraser: I did an undergraduate degree at Dalhousie University. Then I did two years studying German in Germany. I've always been interested in brain research, so I followed up with graduate school in Toronto— first a master's in 1984 and then a Ph.D. in 1988— looking at the biochemistry of multiple sclerosis. I then did postgraduate work in multiple sclerosis at Harvard Medical School until early 1991. My backup project was in Alzheimer's disease. It was an interesting time, because the gene for APP had just been cloned, and research into Alzheimer's disease was exploding, particularly in Boston. By sheer coincidence, as I was finishing up my postdoctoral work, the [Centre for Research in Neurodegenerative Diseases at the University of Toronto] was setting up as a basic research institution funded by the Alzheimer Association of Ontario and donors such as Mark Tanz.** It worked out perfectly for me, because I fitted in with their mandate. My wife also was offered a partnership at a law firm [in Toronto], so it worked out rather well.

Q: *What was your reaction when you were asked to be an associate editor?*

Fraser: JBC is highly regarded in the neurodegenerative diseases field. I was incredibly honored to be asked. I was a little apprehensive about the commitment that's involved! But I talked to Marty [Fedor, the JBC's editor-in-chief] and Ken Neet [a JBC associate editor at the Rosalind Franklin University of Medicine and Science] and was convinced that it would be a great experience. It is a lot of work, but it's actually enjoyable. I am finding I have much more contact with people. I also cover a whole range of topics that in the past I didn't have the time to read up on. It's certainly broadened my perspective.

Q: *What are your hobbies?*

Fraser: I do a lot of ocean sailing when I can. I have done a lot of sailing here on the Great Lakes. But I know some people who are sailing around the world, and I connect with them every once in a while. I've done a couple of trans-Atlantic [trips] and a really big trans-Pacific [one] from New Zealand to Argentina. It blew the whole December holiday, but it was fun!

Q: *What is your motto in life?*

Fraser: Try to be fair and just and treat people honestly. XOXO

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the senior science writer for ASBMB Today and the technical editor for the Journal of Biological Chemistry.

FOOTNOTES

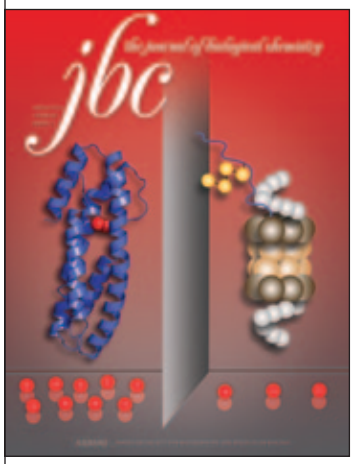
* Presenilins are a family of transmembrane proteins that function as a part of the gamma-secretase protease complex.

** Tanz is a community leader who, after his mother's death from Alzheimer's disease in 1986, pledged millions of dollars to fund the Tanz Centre for Research in Neurodegenerative Diseases.

jbc THE JOURNAL OF BIOLOGICAL CHEMISTRY

Viewing all reactive species in one take

BY RAJENDRANI MUKHOPADHYAY



Reactive oxygen and nitrogen species arise in a variety of forms that oxidize, nitrate, nitrosate and halogenate biomolecules. As Balaraman Kalyanaraman at the Medical College of Wisconsin explains, reactive species are critical for the proper functioning of cells. When they go awry, these species can cause an array of diseases ranging from cardiovascular illness to neurodegeneration. But researchers lack real-time and high-throughput methods that clearly identify and quantify the different types of reactive species. In a recent "Paper of the Week" in the Journal of Biological Chemistry, Kalyanaraman and colleagues combined a high-throughput fluorescence plate reader with special probes and high-performance liquid chromatography to rapidly detect and quantitate several reactive species at once. Kalyanaraman says the plate reader works as a first-step screening tool to measure increases in fluorescence caused by superoxide, hydrogen peroxide, nitrosating agents and peroxynitrite. HPLC is then used to confirm the specific identity of the reactive species and quantify them. As proof of principle, the investigators demonstrated the real-time monitoring of reactive oxygen and nitrogen species in activated macrophages. They got a better understanding of the rapid sequence of events and their kinetics in the formation of reactive species, processes that have been hard to elucidate in real time by other approaches. Kalyanaraman hopes their method "will lead to more rigorous detection and description of reactive species in all biological models." He adds that the approach also can be used to screen potential antioxidant and anti-inflammatory drugs rapidly.

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the senior science writer for ASBMB Today and the technical editor for the Journal of Biological Chemistry.

REFERENCE

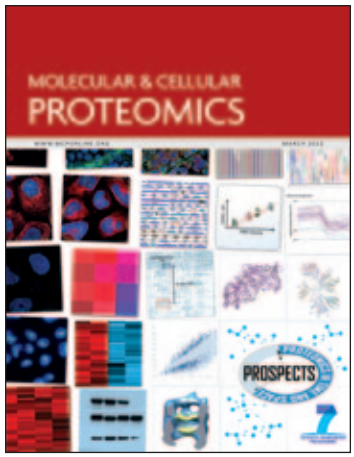
Balaraman Kalyanaraman, et al.; *J. Biol. Chem* (2012) doi: jbc.M111.309062

MCP MOLECULAR & CELLULAR PROTEOMICS

Deciphering the role of antibody glycosylation in vaccine effectiveness

BY RAJENDRANI MUKHOPADHYAY

Immunoglobulin G, or IgG, is a type of an antibody critical to fighting off bacteria and viruses. People get vaccinated to stimulate their bodies to produce IgGs against known pathogens and confer immunity. IgGs are heavily glycosylated, but "we only know very little about how [the glycosylation] is regulated," says Manfred Wuhrer at Leiden University Medical Center in the Netherlands. In a paper recently published in Molecular & Cellular Proteomics, Wuhrer and colleagues looked at the changes in glycosylation patterns of a subtype of IgG when 10 white European adults and 10 black African children were vaccinated with tetanus and several kinds of influenza. They studied the sugars in the IgG1 subtype by mass spectrometry, which was technically challenging to do, because the method had to be sensitive enough to detect the changes in glycosylation reproducibly and robustly. As Wuhrer explains, the glycosylation changes were observed to be the same in both Africans and Europeans irrespective of age and vaccine type, with an increase in galactose and sialic acid within weeks after vaccination. These data suggested that depending on when the person was vaccinated, the invading pathogen faced IgGs with different glycosylation profiles. This in turn could influence the effectiveness of the IgGs in combating infection. Wuhrer says, "We hope that our paper, together with the body of literature on the functional consequences of IgG glycosylation changes, will stimulate vaccine developers to consider antibody glycosylation as a factor that has to be taken into account in vaccine development."



Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the senior science writer for ASBMB Today and the technical editor for the Journal of Biological Chemistry.

REFERENCE

Maurice H. J. Seldman, et al.; *Mol. Cell Proteomics* (2011) doi: mcp.M111.014563

THE JOURNAL OF LIPID RESEARCH

Building on the legacy of a lipid pioneer

BY MARY L. CHANG

The lipid community lost a pioneer, scientist, clinician and beloved teacher late last year. Tatu Miettinen passed away in November at the age of 81 in a car accident. Two papers published in 1965, the very early days of the Journal of Lipid Research, that Miettinen co-authored, "Quantitative isolation and gas-liquid chromatographic analysis of total fecal bile acids" and "Quantitative isolation and gas-liquid chromatographic analysis of total dietary and fecal neutral steroids," are considered part of the groundwork for today's understanding of cholesterol metabolism (1, 2).

Unbeknownst to many, Miettinen's innovative thinking led to the development of the globally available product Benecol, a margarine product containing plant stanol ester, which has been shown to lower blood cholesterol levels. Miettinen was one of the founders of the 1990s research initiative the Scandinavian Simvastatin Survival Study, commonly known as 4S, which is considered a major milestone in cardiology research, as it provided clear evidence that statins reduce the risk of death by coronary heart disease. You can read more about Miettinen's life and scientific legacy in "In Memoriam: Tatu A. Miettinen (1930–2011)," co-written by Y. Antero Kesaniemi of the University of Oulu and Oulu University Hospital and Scott M. Grundy of the University of Texas-Southwestern Medical Center at Dallas, published in the March issue of the JLR (doi:10.1194/jlr.E023853).

The apolipoprotein C-III research conducted by Ariel Brautbar of the Baylor College of Medicine and colleagues could be taken as an extension of Miettinen's work, because without the positive results of 4S, other later statin studies would not have been possible. Increased apoC-III levels have been associated with atherosclerosis in both human and animal models. In "LPL gene variants affect apoC-III response to combination therapy of statins and fenofibric acid in a randomized clinical trial of individuals with mixed dyslipidemia" (doi:10.1194/jlr.M20404), trial participants took either fibrate (a medication that has been shown to increase HDL levels and decrease triglyceride levels) alone or in conjunction with a statin. Genetic variation via single polymorphisms was assessed in these individuals to determine if genetic differences had the expected positive effects on lipid and apolipoprotein levels by statin-fibrate combination therapy.

In total, three SNPs were identified in the lipoprotein lipase gene that increase apoC-III levels or seem to counteract the reduction in apoC-III levels usually seen with statin-fibrate combination therapy. While these SNPs were considered rare in frequency among the trial participants, all of whom had an increased risk for developing cardiovascular disease, this study represents the first report of genetic variation in the LPL gene region. Overall, Brautbar et al.'s findings suggest the benefit of combination therapy may vary from individual to individual and that clinicians may need to tailor treatment regimens.

Mary L. Chang (mchang@asbmb.org) is managing editor of the Journal of Lipid Research and coordinating journal manager of Molecular and Cellular Proteomics.

REFERENCES

1. Grundy, Scott M., E.H. Ahrens, Jr., and Miettinen, T.A. (1965) Quantitative isolation and gas-liquid chromatographic analysis of total fecal bile acids. *J. Lipid Res.* **6**, 397–410.
2. Miettinen, T.A., E.H. Ahrens, Jr., and Scott M. Grundy. (1965) Quantitative isolation and gas-liquid chromatographic analysis of total dietary and fecal neutral steroids. *J. Lipid Res.* **6**, 411–424.

jbc THE JOURNAL OF BIOLOGICAL CHEMISTRY

From butterflies to politicians

BY RAJENDRANI MUKHOPAHDYAY

Bengt Mannervik of Stockholm University and Uppsala University didn't start out life as a Mannervik. He was born as Bengt Eriksson, but in 1968, at the age of 25, he formally took on his maternal grandparents' name. This and other interesting nuggets are in Mannervik's recent "Reflections" article for the Journal of Biological Chemistry collection of memoirs, contributed over the years by outstanding molecular biologists and biochemists (1).

Mannervik's scientific career largely has focused on glutathione, a molecule critical for biological redox reactions and detoxification. His research interest got sparked when he was an undergraduate student at Stockholm University in the early 1960s. Over 50 years, his group has discovered and characterized several forms of glutathione transferase, known as GSTs; analyzed how the action of GSTs could protect against certain neurodegenerative diseases; and teased out details of unconventional enzymatic behavior using regression analyses, which are statistical tools for understanding several variables.

Mannervik's Uncle Folke figured prominently in his child-

hood. The husband of his paternal aunt, Folke Fridén was an amateur scientist who used his kitchen as a lab. (Mannervik doesn't reveal what his Aunt Sigrid's reaction was to this.) Fridén enlisted Mannervik and Mannervik's brother to help him with experiments on butterflies, moths, caterpillars and the developmental stages in between. Mannervik was introduced to biochemistry as they used electrophoresis to discover the types of colored proteins in larvae and pupae. Fridén even wrote a thesis on the energy metabolism of caterpillars after conducting experiments based on defecation frequencies as a measure of food intake and metabolism. Mannervik says he was the only one in the family who found the dissertation mesmerizing.

Bengt Mannervik

In 1962 Mannervik enrolled at Stockholm University as a chemistry undergraduate student. For a summer research project, he began to work on glutathione. While still an undergrad, Mannervik wrote an article for a Swedish newspaper about the biochemical origins of life, compiling information from sources as wide-ranging as Charles Darwin's "On the Origin of Species" and Miller and Urey's now-classic paper describing the synthesis of organic compounds from inorganic starting materials under simulated conditions (2). This article caught the attention of Klas-Bertil Augustinsson, who admitted Mannervik as a graduate student at Stockholm University, where Mannervik continued to work on glutathione.

Mannervik's work has taken him through biochemical purification and characterization of enzymes, statistical analyses of their behaviors, genetic recombination to produce GSTs with unnatural properties and other adventures. His research, although mostly based on fundamental explorations, has applications in fields as wide-ranging as aging and viniculture.

Mannervik has been a strong advocate for science funding. In 2001, he wrote a rebuttal to the Swedish minister of education and science's claim that Swedish research was well-funded. The rebuttal earned Mannervik lengthy visits over the years from another flighty species, politicians. These visits allowed him to explain to them the nature of fundamental research and how funding opportunities keep the whole endeavor going. Mannervik is right to be proud that in 2008, his conversations helped boost funding to Swedish research by 5 billion kronor (about $750 million by today's exchange rate).

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the senior science writer for ASBMB Today and the technical editor for the Journal of Biological Chemistry.

REFERENCES

1. Mannervik, B. Five decades with glutathione and the GSTome (2012). *J. Biol. Chem.* doi:10.1074/jbc.X112.342675
2. Miller, S. L., and Urey, H. C. Organic compound synthesis on the primitive earth (1959). *Science*, **130** (3370), 245.

Speak, tweet and drink up!

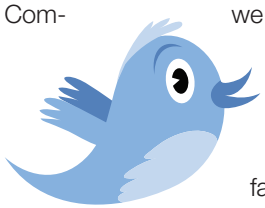
As the annual meeting approaches, we offer tips for those who want to get their research noticed and take part in the on-site and online discussions

BY ANGELA HOPP

Experimental Biology 2012 is just over a month away, so this is a good time to start gearing up for the science communication fest that it promises to be. The American Society for Biochemistry and Molecular Biology annual meeting has a couple of scicomm events planned, and it's more important than ever for researchers to engage in the vibrant discussions continuously happening on social media channels.

Public affairs programming

For those looking for a more formal venue in which to learn more about how to share science with the public, the ASBMB Public Affairs Advisory Committee has organized a session for 12:30 p.m. April 23. "Effectively Communicating Your Science" will feature Nobel laureate Paul Berg, National Public Radio science correspondent Joe Palca, science communicator Megan J. Palmer and Huffington Post science correspondent Cara Santa Maria. Moderated by ASBMB President-elect Jeremy Berg, the panel will discuss how to get through to challenging audiences and make the best case for long-term investment in science.



Informal mixer at brewery

Meanwhile, the society has partnered with the San Diego Biotechnology Network for an informal tweetup for those interested in mingling with media types, public speakers and various online personae. "Brewing Science" will be held at 7:30 p.m. April 23 at the Mission Brewery, 1441 L Street, near the convention center. Come have a drink and some good conversation.

#EB2012: Don't forget to use it!

While we're on the topic of tweeting, meeting attendees who feel compelled to comment on Twitter should use the #EB2012 hashtag so that their quips are indexed and retweetable. If you tag @ASBMB in your tweet, we'll do our best to retweet you to our followers. If Twitter isn't your thing, we'll also be broadcasting on our Facebook page: www.facebook.com/asbmb. So, make sure to become a fan and ping us if we can be of any assistance.

It's time to do a little PR

There's just enough time left for you to work with your institution's media relations office on a press release about the research you'll be sharing at the meeting. If you're not sure how to get the ball rolling, visit ASBMB Today at http://bit.ly/zQghRK for a handy guide that we published this time last year. There is so much incredible science at the annual meeting that it's impossible for reporters to cover the event adequately without the help of press releases. So, do yourself, your institution and ASBMB a favor, and help get the word out about your great work. If you send a copy of your press release to media@faseb.org by April 1, our media relations team will include it in the ASBMB materials that reporters who visit the on-site press room receive.

Down for blogging?

Lastly, applications are now being accepted for official EB2012 bloggers. ASBMB is sponsoring several slots for members with prior science blogging experience. Official meeting bloggers will receive complimentary press registration, access to the press room and entry to all scientific sessions of the six sponsoring societies. Apply now at http://bit.ly/A5iyo4! The deadline is March 15. Contact Angela Hopp at ahopp@asbmb.org for more information. XXXX

Angela Hopp (ahopp@asbmb.org) is editor of ASBMB Today.

A life of, and for, change

Minority Affairs Committee recruit takes risks that promise to pay off for him and young underrepresented scientists

BY ANGELA HOPP

Where Dave R. Wilson, the newest member of the American Society for Biochemistry and Molecular Biology Minority Affairs Committee, grew up in rural New Mexico, opportunities for upward mobility — and, well, even neighbors — were few and far between. Nestled in the Navajo Nation Reservation not too far from the Four Corners, his hometown had only four houses, and his school was an 18-mile bus ride away.

As a boy, Wilson was studious. He wanted to become an engineer, as mining was a primary source of income for the locals, including his coalminer stepfather. His grades earned Wilson a full ride to major in mechanical engineering at the University of Arizona in Tucson, but he soon became dissatisfied with the track. Then a summer spent chasing butterflies changed everything.

Taking flight

The flier for the summer program promised six weeks of research at the Rocky Mountain Biological Laboratories in Gothic, Colo. Instead, it delivered something far more awesome: Goloptus psychlictuimus. Wilson, then a sophomore, investigated why the silvery blue females lay their eggs on certain plant calyxes, and he found that the calyxes were toxic to cows, making the offspring quite unlikely to get gobbled up. Wilson was hooked on biology.

Giving up his scholarship, Wilson moved to Phoenix, where he had family, and transferred to Arizona State University in nearby Tempe to major in molecular and cellular biology. He received some federal aid and took a job at a local environmental lab startup that tested for water quality, food contamination and soil contents. He worked hard and rose to director of chemistry, then director of microbiology, and then to director of research and development. After graduation from ASU, he stayed on, making a good living. But he found himself once again yearning for something more.

A clean slate

At the urging of his wife, Paty, Wilson quit the lab. They sold their belongings and, with a newborn in tow, moved in with relatives there in Phoenix. Wilson applied to the Ph.D. program at Arizona State — and nowhere else. No one in his family had gone to graduate school, he explains, so he didn't know any better. He got in.

True to form, Wilson excelled and went on to do a three-year postdoctoral stint at the National Institutes of Health. He was promoted to senior research scientist at the National Institute on Aging, where he studied sirtuin 6 and got his first taste of minority outreach, another passion he decided was worth risking it all.

Drawn in by outreach

The summer leadership institute offered by SACNAS, an organization focused on the advancement of Hispanic, Chicano and Native American scientists, promised to help Wilson and the other 29 participants find out how they could engage underrepresented minorities in science. For Wilson, it did much more.

"My career came to a crossroads," he explains. "I was

Dave R. Wilson visits with Catherine Woteki, the U.S. undersecretary for research, education and economics, and shows "Flat Stanley," who was drawn by his nephew in Arizona. Flat Stanley's adventures in Washington were shared with his nephew's second-grade class.

wondering whether it was more beneficial for me to be the lone Native American scientist doing elite research at the government or whether it was more important for me to help promote opportunities and share my experiences with upcoming Natives who were going through the same struggles." It was a difficult decision. For eight months, Wilson weighed his options, consulting with investigators at NIH, his family and his friends. Then he took a leap of faith, again.

Settling in at SACNAS

For the past 15 months, Wilson has been director of Native American initiatives at SACNAS, a job that involves creating programming that builds young Native Americans' research and professional skills. The three primary challenges faced by young Native Americans considering careers in science, Wilson said, are accessibility to information, family support and access to minority mentors at all levels.

One program Wilson helped spearhead is set to launch this fall at Oklahoma State University. It's called Science Scholars: The Native American Path, or SSNAP. "We want to target Native Americans in a cohort approach," he explains, "so we are selecting 30 (undergraduate) students who are in biomedical sciences." OSU was chosen for its record number of Native American students graduating with bachelor's degrees in the sciences.

Wilson has teamed up with bacteriologist Gilbert John at OSU, who also is a Navajo, to create a curriculum covering lab work, oral and poster presentations, and negotiations and queries for funding and employment opportunities. He's also working closely with another new hire at SACNAS, physicist Yvonne Rodriguez, who oversees the society's programming. Wilson emphasizes that he doesn't want the OSU effort — or any of the SACNAS efforts, for that matter — to be just another program that sounds nice in principle but doesn't have measureable results.

"We want to produce more outcome-based programming," he says. "Being scientists, that's what we're all about."

Seeking efficiencies

Meanwhile, at the NIH, a newly formed group of professionals has been meeting on a monthly basis to talk about minority representation throughout the agency and to find ways to attract minority scientists to the campus. The group, SACNAS's first professional chapter, is another Wilson brainchild, and he's optimistic about what it might achieve.

"The federal dollars are tight these days. If all these agencies are able to understand what services or what programs (to recruit minorities) exist and what they provide, they can work together to fill positions that need attention" and maximize taxpayer dollars, Wilson explains. Today the chapter has 60 members, and Wilson anticipates it will have 200 once it's in full swing.

Teaming up

One of SACNAS's recent initiatives is to forge relationships with scientific associations. "My goal is to be able to connect professionals," Wilson says. "There's been this outcry… about how we get professional societies more involved with our membership."

One way, Wilson determined, is to get in the trenches of professional societies and find out how their missions align with that of SACNAS. So last year Wilson joined the ranks of the ASBMB Minority Affairs Committee. In just a few short months, he's already found synergies: research funding and work-force development.

"Now young postdocs are coming out of their training and are competing with people who've had tenure and lost their position," he says. "Because the NIH funding has remained flat and the NSF only had a 3 percent increase this year, nothing is going up. So the new investigators who are coming up — there's no money for them."

Wilson regularly serves on federal and White House roundtables, weighing in on policy matters in the interest of scientists both young and old. One recurring discussion is about the training of graduate students and postdocs for career alternatives outside academia. "It's important," he says, "to inform trainees that there are so many different positions that need scientific expertise that aren't getting public exposure."

A whole new world

Wilson is living proof that skills learned in the lab are transferrable. He credits his family and mentors with giving him the support and advice he needed to change gears time and again. He says he's glad he's rolled the dice and landed at SACNAS this time. "I had this unique opportunity I had to take and run with!"

Angela Hopp (ahopp@asbmb.org) is editor of ASBMB Today.

Doing your best at the ASBMB Undergraduate Poster Competition

BY HAL WHITE

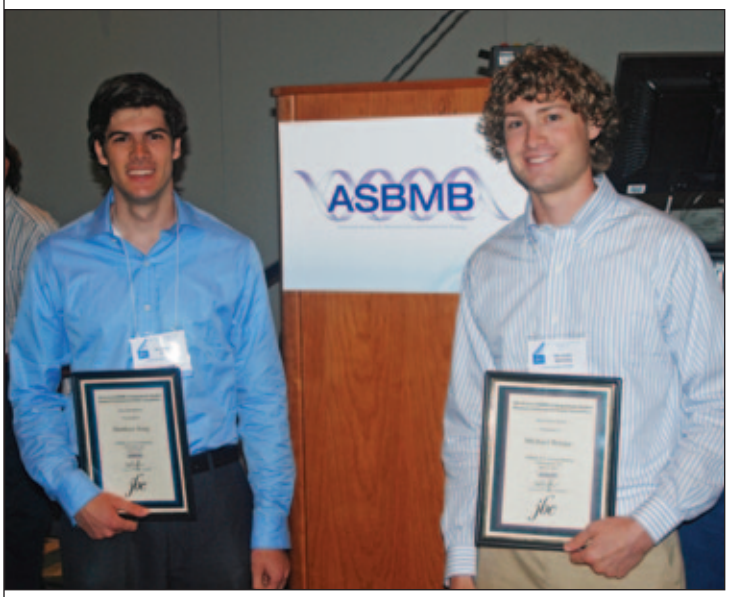
Several years ago at the annual American Society for Biochemistry and Molecular Biology meeting, a friend jokingly said, "I understand that (they) decided to exclude University of Delaware students from the ASBMB Undergraduate Poster Competition because they get too many awards and it would give students from other schools a chance." This was the year after three of the four first-place awards and six of the 22 honorable mentions went to University of Delaware students. While that was an unusual year, over the past decade, University of Delaware students have received more than twice the number of awards in this competition than students from any other school. What is the secret? Is there anything different about these students that enables them to do so well? Perhaps, but there is no secret formula.

Tradition

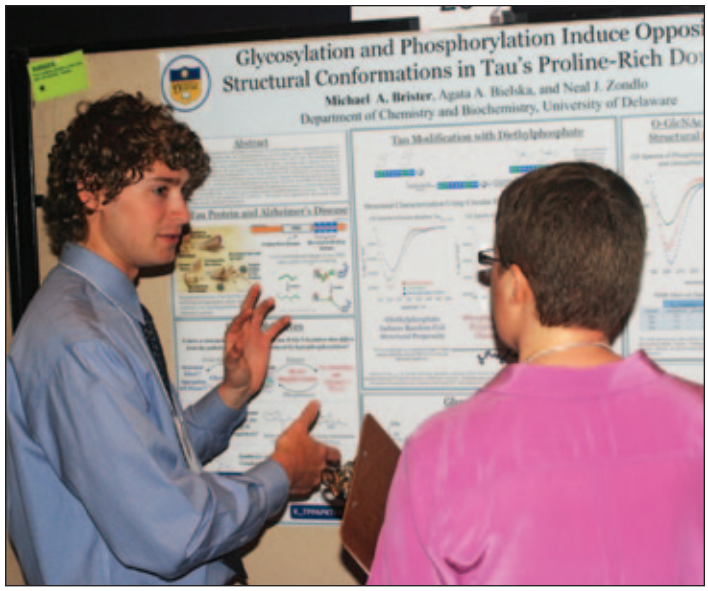
For much of its existence since its founding in 1743, the University of Delaware was a liberal arts college without a graduate program. Although it was not required, students often got involved in faculty research projects, and virtually all faculty members accepted undergraduates into their laboratories. As the school transformed into a Research I institution, it retained its tradition and reputation for promoting undergraduate research. In 1980, the university established an Undergraduate Research Office that provides an infrastructure, organizes campus symposia, oversees a large senior thesis program and coordinates funding from a variety of sources. As a consequence, the school attracts many academically strong students who want to do research. Because space in faculty laboratories is limited and faculty members are selective, competition for positions is significant.

Funding

In part because of its reputation and tradition, the university has attracted funding to support its undergraduate research programs from federal, state and private institutions and alumni sources. In a typical summer, more than 150 students in science, technology, engineering and math disciplines engage in funded research on campus. The Howard Hughes Medical Institute Undergraduate



Matthew King and Michael Brister of the University of Delaware both won awards at the undergraduate poster competition in 2011.



Brister, who won first place, explains his work to an attendee at the 2011 ASBMB annual meeting in Washington, D.C.

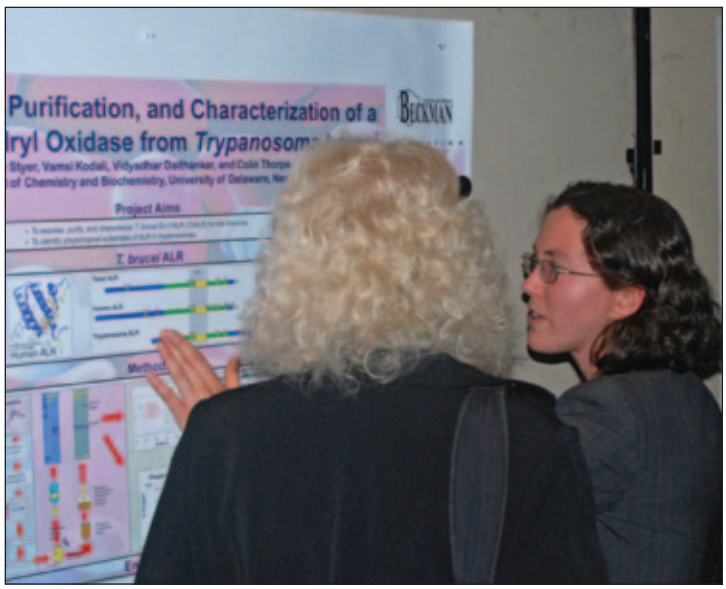
Science Education Program funds between 20 and 30 of those. The grant also pays for 10 to 15 students to attend the annual Experimental Biology meetings and participate in the ASBMB Undergraduate Poster Competition. Those students are selected from among all students, not just those who receive HHMI support.

Selection

During our summer undergraduate research enrichment program, students in molecular life sciences learn about the ASBMB poster competition, and it is held up as something they can attend if they have publishable results and the approval of their research sponsors. The program also includes a session on how to design a poster. Students present their first posters at a universitywide symposium celebrating undergraduate research in mid-August. There, faculty members talk with students about their research and give them pointers. In the fall, students who have made good progress are encouraged to present their research at a regional poster competition sponsored by the National Institutes of Health at the University of Maryland, Baltimore County. Students who do well there are encouraged to submit abstracts for the ASBMB poster competition.

Preparation

By the time students present posters at the ASBMB competition, they usually have two years of research experience and have presented and revised their posters several times. They have interacted with faculty members and judges, who have critiqued their research and their posters. In addition, those students who plan to attend the Experimental Biology meetings receive final rigorous critiques of their posters and are expected to revise them once again.



Amy Styer, an undergrad at the University of Delaware who won an honorable mention at the 2010 meeting, describes her work.

Among the issues we address are the following:

- Posters are about visual communication. They are not manuscripts of linear text tacked to a board. Minimize text and make the text you have visible.
- Titles should be brief, readable, understandable, interesting and informative.
- Headings such as “Introduction,” “Materials and Methods,” “Results” and “Conclusions” are discouraged. Every poster has those topics. Why waste space? Instead, substitute headings that say something unique and informative about what you did or found.
- Include attractive conceptual visuals that provide focus and highlight your work. If the report addresses several issues, they can be color-coded and connected by color to data on other panels.
- If you are a cell biologist, be sure to include molecular interpretations and structures.
- Sections on future work can be eliminated, and citations can be in small print as needed.

With regard to the actual presentation, here is the advice we give to students:

- Dress appropriately.
- Greet the judge and find out his or her area of expertise so that you can adapt your presentation. Judges are not experts in everything. Remember, your judges are smart, but they may know less about your subject than you do.
- Don’t give a long speech. Give a concise summary and let the conversation be driven by questions.
- Know the background and history of your research. Read and understand relevant textbook chapters.

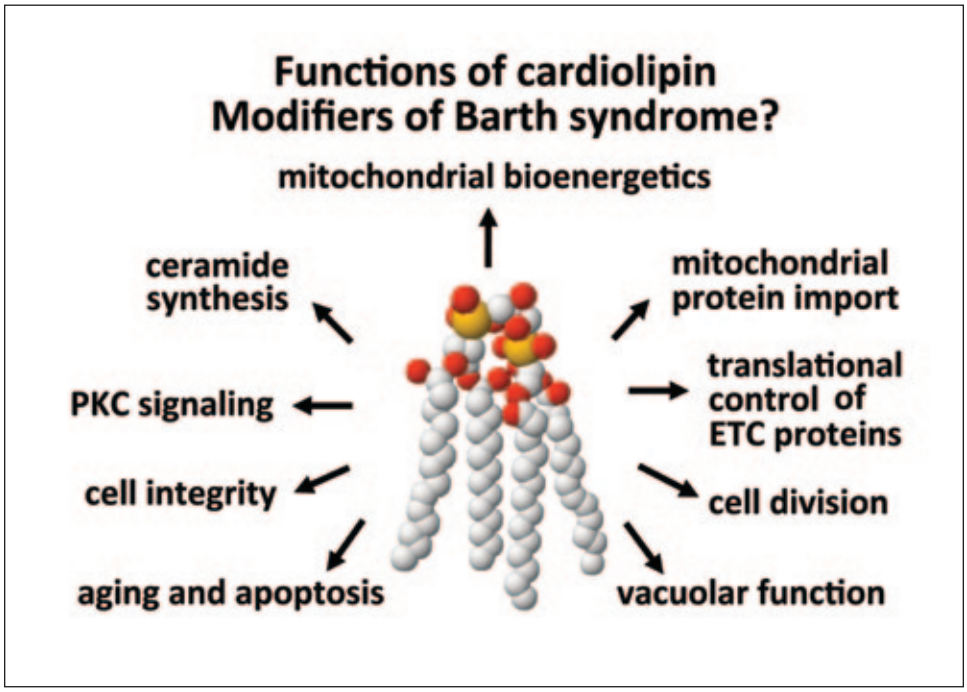
Certainly, there are faculty members and other schools that have been successful with their students at the ASBMB Undergraduate Poster Competition, and there are other schools that have excellent undergraduate research programs and would do well but choose to participate in other national venues.

Hal White (halwhite@udel.edu) is a professor of biochemistry at the University of Delaware and director of the Howard Hughes Medical Institute undergraduate program there.

Functions of cardiolipin as modifiers of the Barth syndrome phenotype

BY MIRIAM L. GREENBERG

Barth syndrome, or BTHS, is an X-linked genetic disorder characterized by dilated cardiomyopathy, skeletal myopathy, neutropenia and 3-methylglutaconic aciduria, resulting from mutations in the tafazzin gene (1). Tafazzin is a transacylase that remodels the mitochondrial phospholipid cardiolipin. Key findings linking CL to BTHS include the fact that BTHS fibroblasts exhibit decreased CL, defective acylation of CL with unsaturated fatty acids, and accumulation of the intermediate monolysocardiolipin. Importantly, the predominant CL species in the heart, tetralinoleoyl-CL, is absent from BTHS cells. BTHS is the first disorder known to result directly from perturbation of CL metabolism. Like many monogenic disorders, BTHS is characterized by a wide range of symptoms, from severely debilitating and often fatal to nearly asymptomatic. The molecular mechanisms underlying clinical disparities in monogenic disorders are not understood, because most genes exhibit multiple interactions. Understanding these interactions will shed light on the disparities.



Elucidating functions of CL may identify modifiers of BTHS

Yeast has been pivotal in elucidating the functions of CL, as null mutants are available for every step of CL synthesis and genetic and genomic analyses readily can be applied (2). The pathway for CL synthesis is highly conserved. Yeast tafazzin mutants exhibit the same biochemical and respiratory deficiencies as BTHS cells and are complemented by the human tafazzin gene. Exciting findings in yeast indicated that CL plays an important role not only in mitochondrial bioenergetics but also in essential cellular functions not associated with respiration, including mitochondrial protein import, PKC signaling and cell integrity, vacuolar function and V-ATPase activity, cell division, and ceramide metabolism and longevity, among others (2–5). Decreases in these activities may thus exacerbate the phenotype associated with CL deficiency.

CL is required for optimal mitochondrial protein import, which may be affected in BTHS

CL mutants exhibit decreased mitochondrial protein import, synthetic interactions with mutants in outer mitochondrial membrane translocases, and defective assembly of outer membrane complexes (6, 7). Intriguingly, this defect also was observed in a BTHS lymphoblast cell line (7). This has implications for BTHS, as a BTHS-like illness known as dilated cardiomyopathy with ataxia syndrome, or DCMA, is caused by mutations in the gene DNAJC19/TIM14, the likely homolog of the yeast mitochondrial import gene Tim14 (2). The clinical similarities of DCMA and BTHS suggest that the defects in BTHS may be caused or exacerbated by defective mitochondrial protein import.

Prospects for elucidating the physiological modifiers of BTHS are promising

Numerous advances in both basic and targeted research constitute a strong foundation for studies to elucidate the modifiers of BTHS:

1. A vast literature is available describing the biochemistry of CL since its identification by Mary Pangborn 70 years ago (8).
2. Yeast mutants are available for all genes in the CL pathway, facilitating the application of "the awesome power of yeast genetics."
3. BTHS models are characterized in yeast, Drosophila, zebrafish and mice (2, 9).
4. Advances in lipid chemistry have dramatically improved the analysis of CL species, which can now be identified in blood spots (10).
5. The Barth Syndrome Foundation (http://www.barthsyndrome.org) has a large repository of medical information collected from patient records. The tremendous contribution of this organization to research and the dissemination of information about BTHS cannot be overstated.

In conclusion, exploiting the yeast model to elucidate CL functions is expected to identify physiological modifiers of CL deficiency, which may shed light on the disparity of symptoms in BTHS patients and may provide targets for new treatments of BTHS and other disorders of CL metabolism.

Miriam L. Greenberg (mlgreen@sun.science.wayne.edu) is an associate dean for research at the Wayne State University College of Liberal Arts and Sciences and a professor in the department of biological sciences.

REFERENCES

1. Schlame, M., and Ren, M. (2006) Barth syndrome, a human disorder of cardiolipin metabolism. *FEBS Lett.* **580**, 5450–5455.
2. Joshi, A. S., Zhou, J., Gohil, V. M., Chen, S., and Greenberg, M. L. (2009) Cellular functions of cardiolipin in yeast. *Biochim. Biophys. Acta.* **1793**, 212–218.
3. Chen, S., Liu, D., Finley, R. L., Jr., and Greenberg, M. L. (2010) Loss of mitochondrial DNA in the yeast cardiolipin synthase crd1 mutant leads to up-regulation of the protein kinase Swe1p that regulates the G2/M transition. *J. Biol. Chem.* **285**, 10397–10407.
4. Chen, S., Tarsio, M., Kane, P. M., and Greenberg, M. L. (2008) Cardiolipin mediates cross-talk between mitochondria and the vacuole. *Mol. Biol. Cell.* **19**, 5047–5058.
5. Zhou, J., Zhong, Q., Li, G., and Greenberg, M. L. (2009) Loss of cardiolipin leads to longevity defects that are alleviated by alterations in stress response signaling. *J. Biol. Chem.* **284**, 18106–18114.
6. Jiang, F., Ryan, M. T., Schlame, M., Zhao, M., Gu, Z., Klingenberg, M., Pfanner, N., and Greenberg, M. L. (2000) Absence of cardiolipin in the crd1 null mutant results in decreased mitochondrial membrane potential and reduced mitochondrial function. *J. Biol. Chem.* **275**, 22387–22394.
7. Gebert, N., Joshi, A. S., Kutik, S., Becker, T., McKenzie, M., Guan, X. L., Mooga, V. P., Stroud, D. A., Kulkarni, G., Wenk, M. R., Rehling, P., Meisinger, C., Ryan, M. T., Wiedemann, N., Greenberg, M. L., and Pfanner, N. (2009) Mitochondrial cardiolipin involved in outer-membrane protein biogenesis: implications for Barth syndrome. *Curr. Biol.* **19**, 2133–2139.
8. Pangborn, M. C. (1942) Isolation and purification of a serologically active phospholipid from beef heart. *J. Biol. Chem.* **143**, 247–256.
9. Acehan, D., Vaz, F., Houtkooper, R. H., James, J., Moore, V., Tokunaga, C., Kulik, W., Wansapura, J., Toth, M. J., Strauss, A., and Khuchua, Z. (2011) Cardiac and skeletal muscle defects in a mouse model of human Barth syndrome. *J. Biol. Chem.* **286**, 899–908.
10. Kulik, W., van Lenthe, H., Stet, F. S., Houtkooper, R. H., Kemp, H., Stone, J. E., Steward, C. G., Wanders, R. J., and Vaz, F. M. (2008) Bloodspot assay using HPLC-tandem mass spectrometry for detection of Barth syndrome. *Clin. Chem.* **54**, 371–378.

Author's note

While the focus of this article is on the role of cardiolipin in Barth syndrome, the subtext echoes the sentiment of Yusuf Hannun and Dan Raben regarding the current threat to basic research (1).

The financial dilemma scientists currently face is exacerbated by the skewing of funding in the direction of translational and targeted research at the expense of curiosity-driven science. Basic research in simple model systems such as yeast often faces even greater funding challenges, despite the fact that the yeast model system provides researchers with the ability to apply powerful genetic approaches to study fundamental cellular processes in a time- and cost-effective system. The knowledge gained in a simple model system such as yeast can then often be applied to higher eukaryotes.

Our understanding of the role of CL in BTHS has its roots in basic research, much of it in the yeast model. Decades of biochemical studies have characterized the interactions of CL with mitochondrial proteins. The diagnosis of BTHS is now facilitated by technological advances in lipid chemistry and lipidomics that were developed by curiosity-driven research. The identification of yeast CL null mutants provided powerful tools for in vivo studies of CL function from which we have learned that CL is essential for optimal mitochondrial bioenergetics and for assembly and stability of electron-transport chain supercomplexes. Respiratory and supercomplex defects that characterize BTHS can be understood in the context of these studies. The role of CL in the assembly and import of mitochondrial proteins was first shown in yeast CL mutants and has since been verified in BTHS lymphoblasts. A simple growth experiment in yeast mutants and subsequent synthetic lethality and suppressor analyses, which cannot be readily carried out in more complex organisms, have led to the discovery that CL plays an important role in essential cellular functions apart from respiration. These functions may hold the key to identifying modifiers of the BTHS phenotype.

In summary, while the link between CL and BTHS has been known for just over a decade, our understanding of this disorder and of many other human diseases would not have been possible without basic, curiosity-driven research (2).

REFERENCE

1. Hanun, Y. and Raben, D. The Toxic Professor Syndrome. *ASBMB Today.* August 2011: 10-11.
2. Vance, D. E. (2006) *FEBS Lett.* **580**, 5430–5435.

Taking technology out of the lab and into the world

Rachel A. Cassidy talks about her career in tech transfer

BY RACHEL CASSIDY

Science, intellectual property (which includes patents, copyrights, trademarks and trade secrets) and business converge in the field of technology transfer. Its focus is the transfer of IP rights from the nonprofit academic sector to the for-profit sector for commercialization so that academic innovations can be turned into products and services for public good.

The interdisciplinary nature of technology transfer attracts people with all kinds of academic backgrounds. Some may have science or engineering undergraduate degrees and law degrees. Others may have earned M.B.A.s. As an associate director at Johns Hopkins University's Technology Transfer Office in Maryland, I fall into the group of people who have doctoral degrees in science. I earned my doctorate in biophysics and biophysical chemistry at Johns Hopkins University in 2003 under the guidance of Paul S. Miller. My thesis project focused on triplex formation in DNA, and it touched upon biochemistry, biophysics and chemistry. I enjoyed my time in the lab and really liked working with my adviser. However, in the third year of graduate school, I realized that I did not want to pursue the traditional academic career path. Although my experience in lab was great, it wasn't a perfect fit for me. I wanted to interact more with people. I was interested in science on a broader scale and didn't want to spend the rest of my life focused on a tiny microcosm of science. I also found the idea of working with science that was closer to being a product very exciting.

Luckily, my adviser supported my search for a career away from research. One of my first resources was a book called "Alternative Careers in Science" by Cynthia Robbins-Roth. A good friend of mine from college was working as a patent attorney. I picked her brain about what a typical day was like for her. She helped me contact others in her field so that I could request informational interviews. I asked people to share with me the stories of their career paths and tell me about their job descriptions.

As I entered my last year of graduate school, Johns Hopkins University's Technology Transfer Office started a two-year internship program. I immediately applied. I knew that I was interested in technology transfer, but I wasn't sure if I was more geared for science and law, or science and business, or the combination of science, law and business, which is technology transfer. I saw the internship as the perfect opportunity to determine where my interests and strengths lay and was overjoyed when I got accepted.

In my first year of the internship, I passed the Patent Bar Exam. Individuals may sit for the Patent Bar Exam if they have a certain number of undergraduate science credits even if they have not gone to law school. Because I hadn't gone to law school, passing the exam made me a registered patent agent (as opposed to a patent attorney). I was actually promoted early from the internship program to a technology-licensing associate position. I took to the work quickly and loved it, managing my own docket of cases.

Rachel Cassidy takes on the 20-mile Northern Central Railroad Trail in Maryland near the Pennsylvania border.

I left technology transfer for a while and took a position as a patent agent within an R&D group at a medical device company. I wanted to gain experience working in industry and see things from a different perspective. Working

Cassidy attends the 2011 BIO International Convention in Washington, D.C., with Lani Hummel, director of corporate partnerships at Johns Hopkins University, and R. Keith Baker, senior director for licensing at the Hopkins tech-transfer office.

in industry was a great experience, but, as sometimes happens, the company disbanded the R&D group where I was working. As luck would have it, my previous technology transfer office was hiring!

I had started my first year of a part-time M.B.A. program at the University of Maryland while I was working at the company and finished that degree after my return to academic technology transfer. Working full time and going to school part time was surely a grind, as anyone who has experienced it will tell you. However, I am very grateful that I rounded out my scientific knowledge with the business knowledge and acumen that I acquired through my M.B.A. program. I feel my doctoral and master's degrees and patent agent status touch upon all three cornerstones of technology transfer.

Our office receives Invention Disclosure Reports from faculty in the general areas of devices, diagnostics, therapeutics, and research tools and reagents. In my initial review of an IDR, I use my science background to understand what the invention is. I also tap into my business experience to begin thinking about how this invention might be translated into a finished commercial product. In the early stages of review of a new IDR, my colleagues and I do preliminary patent landscape and market analyses to see if other patents and patent applications already exist in the field of the invention and whether the invention has the potential to generate revenues.

Another major component of technology transfer is business-development outreach and marketing. It is critical to find the right homes for technologies for further development. The first step is finding a potential licensee. Once a potential licensee confirms interest in a technology, then the negotiation process begins! Of course, one of the most important aspects of any new negotiation is determining the value of the technology. The goal of the negotiation is a fully executed license agreement.

To enter the world of technology transfer, I believe that you must have a broad interest in science. You should also demonstrate critical and analytical thinking and multitasking abilities. Good communication and people skills are crucial, because you have deal with a variety of people, ranging from the academic scientist to a company representative.

A great resource for learning more about technology transfer is the Association of University Technology Managers (www.autm.net). Many people in the field also belong to the Licensing Executives Society in the U.S. and Canada (www.lesusacanada.org; for international members, it's www.lesi.org). An organization with a focus on intellectual property is the American Intellectual Property Law Association. Another resource that I would recommend can be found at www.cogr.edu/Pubs_intellectual.cfm.

Both the National Cancer Institute and the National Institutes of Health offer fellowships in technology transfer. For more information, please see http://ttc.nci.nih.gov/employment/crtafe.php and www.ott.nih.gov/about_nih/IRTA.aspx.

Alternatively, volunteering at your university's technology transfer office is also a great way to learn more about the field and begin to gain experience. I suggest you contact your university's technology transfer office and ask about volunteer opportunities.

Rachel Cassidy (rcassid1@jhmi.edu) is an associate director at Johns Hopkins University's Technology Transfer Office in Baltimore, Md.

The men behind Western blotting

BY RAJENDRANI MUKHOPADHYAY

In the January 2012 issue of ASBMB Today, I profiled American Society for Biochemistry and Molecular Biology member W. Neal Burnette, describing him as the man who developed Western blotting (1). In doing so, I might have inadvertently given some readers the impression that Burnette was the only person who worked on protein immunoblotting. But it's critical to note that two other groups had made important contributions to the technique in the late 1970s and published their findings before Burnette was able to do so.

Burnette

Stark

George Stark, now at the Cleveland Clinic but then at Stanford University, and his colleagues published the first paper that described the transfer of proteins by capillary action from a polyacrylamide/agarose gel with or without the denaturing agent SDS onto a special membrane called diazobenzyloxymethyl-paper (2). The membrane is called DBM-paper for short. Stark's group was already famous for developing the RNA immunoblotting technique known as "Northern blotting" (3). The name was a joke based on the DNA immunoblotting technique called "Southern blotting," which was named after its inventor, Edwin Southern at Oxford University (4). It was for Northern blotting, Stark explains, that his laboratory became experts in making DBM-paper. In 1975, Stark's group had described how to make chemically reactive cellulose that would covalently bind to DNA and RNA (5). This powdered cellulose could be used to isolate complementary nucleic acids by hybridization. This chemistry was the basis for Northern blotting, but Stark's group used paper rather than powdered cellulose for the method.

"Following on from that, we soon realized that there was a problem in detecting specific proteins," says Stark. They used the same chemistry as for Northern blotting, because they realized DBM-paper reacted with both nucleic acids and proteins. When the proteins transferred out of the gel, they covalently bound to the DBM-paper. "The surprise bit was that the immobilized protein reacted so nicely and specifically with antibodies," notes Stark. They submitted a description of their method to the Proceedings of the National Academy of Sciences in April 1979, and the paper appeared in July.

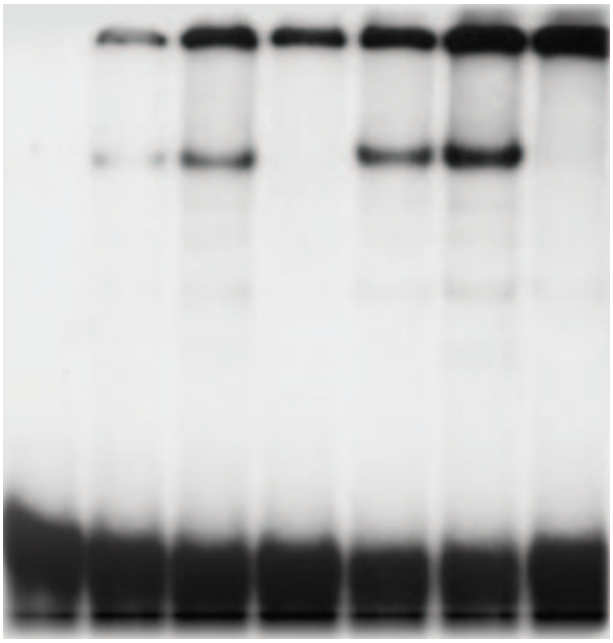
Meanwhile, over in Europe, Harry Towbin was a postdoctoral fellow in the laboratory of Julian Gordon at the Friedrich Miescher Institute for Biomedical Research in Switzerland. Like Burnette, Towbin was dealing with an analysis problem in his research project, which focused on making antibodies against ribosomes for structure-function studies (6). Towbin's problem was much like Burnette's: Both were trying to figure out the specificity of antibodies against proteins in complex macromolecular structures but realized they didn't have an easy and reliable biochemical tool for the analysis.

Towbin

Unaware of the work being done by Stark's group, Towbin and Gordon, along with Theophil Staehelin at Roche, began to work out a method that would allow them to establish which antibody bound to which component of the ribosomal complex. By that point, DNA and RNA immunoblotting methods were popular, so the idea of transferring proteins out of a gel and onto a membrane seemed natural. "It was in the air!" says Towbin, who is now set to retire from the Swiss Federal Institute of Technology Zurich in April.

He says they knew that proteins, but not RNA, bound to nitrocellulose, so they separated ribosomal proteins on a polyacrylamide gel with urea as a denaturing agent

and then electrophoretically transferred them onto nitrocellulose. The proteins noncovalently clung to the nitrocellulose, but RNA didn't; this feature nicely eliminated the nucleic acid from the proteins. Although they primarily focused on gels with urea as the denaturing agent, Towbin says they also got their approach to work with SDS.



The Gordon group submitted a description of its method to the Proceedings of the National Academy of Science in June 1979, and it appeared in the journal in September (7). The timing was such that the two groups were unaware of each other's work until publication.

Stark says his own lab became nitrocellulose converts once appropriate nitrocellulose membranes became commercially available. DBM-paper, which has to be made chemically active prior to immunoblotting, "is not as convenient as just picking up a piece of paper out of a package and blotting directly onto it," he says. "There is no question that blotting onto the appropriate derivatives of nitrocellulose was the way to go."

Burnette was unaware of the work done by the two groups as he was developing his approach but saw the Stark and Gordon groups' papers in print while he was preparing his manuscript. But he felt that his method was different enough to press ahead. He focused on electrophoretically transferring proteins out of SDS-polyacrylamide gels onto nitrocellulose in a more quantitative manner. When Burnette finally got his paper published, he called the approach "Western blotting" in the title and explained the rationale for the name at the end of the introduction (8). For this reason, Burnette is credited for giving protein immunoblotting its nickname (9).

But Stark says his group was calling its method by the same name well before the Burnette paper showed up, although they never used it in their publication. It was completely logical for both Stark and Burnette to come up with the same name: Both were located at research institutions on the West Coast, and the directional joke of immunoblotting was well known by that point (researchers later referred to immunoblotting of post-translational modifications, such as lipids and sugars, as "Eastern blotting").

The three men have said that they were surprised by the method's success and longevity. Indeed, apart from changes in detection methods and other tweaks, the method's principle has persisted unchanged since the 1970s (10).

Towbin is especially amused by how the passage of time has erased the memory of the hard work that went into developing the ubiquitous biochemical tool. "The younger generation of biologists takes the method for granted!" he chuckles.

Rajendrani Mukhopadhyay (rmukhopadhyay@asbmb.org) is the senior science writer for ASBMB Today and the technical editor for the Journal of Biological Chemistry.

REFERENCES

1. Mukhopadhyay, R. W. Neal Burnette: the man behind the Western blot. *ASBMB Today.* March 2012, 17–19.
2. Renart, J.; Reiser, J.; and Stark, G. Transfer of proteins from gels to diazobenzyloxymethyl-paper and detection with antisera: a method for studying antibody specificity and antigen structure. *Proc. Natl. Acad. Sci.* 1979; **76**, 3116–3120.
3. Alwine, J.C.; Kemp, D.J.; and Stark, G. Method for detection of specific RNAs in agarose gels by transfer to diazobenzyloxymethyl-paper and hybridization with DNA probes. *Proc. Natl. Acad. Sci.* USA. 1977; **74**, 5350–5354.
4. Southern, E.M. Detection of specific sequences among DNA fragments separated by gel electrophoresis. *J. Mol. Biol.* 1975; **98**, 503–517.
5. Noyes, B.E., and Stark, G. Nucleic acid hybridization using DNA covalently coupled to cellulose. *Cell.* 1975; **5**, 301–310.
6. Towbin, H. Origins of protein blotting Biji T. Kurien and R. Hal Scofield (eds.), Methods in Molecular Biology, Protein Blotting and Detection, Vol. 536 Humana Press, a part of Springer Science & Business Media, LLC, 2009.
7. Towbin, H.; Staehelin, T.; and Gordon, J. Electrophoretic transfer of proteins from polyacrylamide gels to nitrocellulose sheets: procedure and some applications. *Proc. Natl. Acad. Sci.* 1979; **76**, 4350–4354.
8. Burnette, W.N. "Western blotting": electrophoretic transfer of proteins from sodium dodecyl sulfate-polyacrylamide gels to unmodified nitrocellulose and radiographic detection with antibody and radioiodinated protein A. *Anal. Biochem.* 1981; **112**, 195–203.
9. Eisenstein, M. A look back: westward expansion. *Nature Meth.* 2005; **2**, 796.
10. Mukhopadhyay, R. Revamping the Western blot. *ASBMB Today.* March 2012, 14–16.

Little bird on the 'Big Island'

In past issues of ASBMB Today, we've asked readers to send in photos of the many fabulous places and people they've visited while away at conferences. This submission was taken while Raymond DuBois and his family were spending some quality time together in Hawaii after attending a cancer research conference in India. *Photo courtesy of Lisa Duboise*

WHAT PEOPLE ARE READING

Here are the most-read articles on ASBMB Today's website in the past three months:

- 'I (finally) have an iPad… Now what?'
- Revamping the Western blot
- Surviving a bioscience Ph.D.
- Five years of giving rural students second chances
- Tabor Award winners
- Gifts for geeks
- Synthetic biology: edging toward the clinic
- W. Neal Burnette: the man behind the Western blot
- Effective laboratory management
- 'Show-Me' science outreach to adult populations

CORRECTION

In the January 2012 print issue, the article "The NSF's two-criteria review" had the wrong date at which the National Science Foundation began requiring two components in all proposals. The date should have read 1997.

READER COMMENTS ONLINE

Learning military lingo, March 2012

One of the chief benefits of Dr. (Emily) Heuring's work is the ability to take military operational concerns into the scientific community. That new widget for detecting nerve agent is not going to be operated in a laboratory. It's going to be operated in an incredibly contaminated environment of vehicle exhaust, burning tires, explosive residue and toxic wastes— typical of war zones. The reverse is also true; she helps the military understand the capabilities and limitations of new and very sophisticated systems. Keep up the good work and getting your boots muddy. You are keeping our sons and daughters, soldiers all, alive on future battlefields. —RB

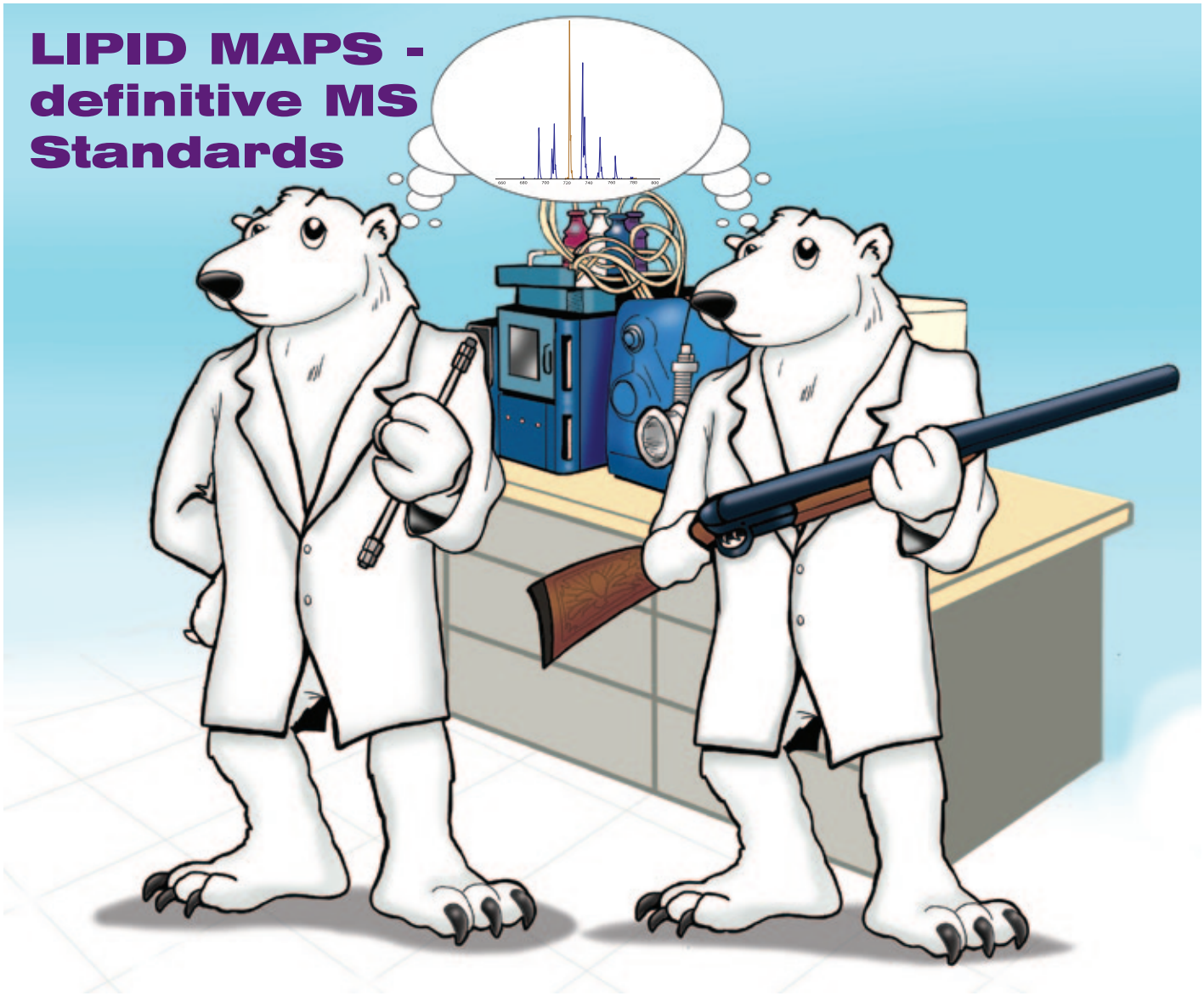
A 'mad race to the finish,' February 2012

This is a typically erudite and eloquent series of reflections by Phil Leder, a scientist of tremendous talent and accomplishment. However, in setting up the interview, Rajendrani Mukhopadhyay might have inadvertently given some readers the impression that the number of nucleotides in the codon was unknown in 1962. The triplet nature of the genetic code had been discovered by Francis Crick and Sydney Brenner a year earlier (in the only hands-on bench science Crick ever did and an intellectual achievement far greater than getting the double helix with Jim Watson). Leder's catalytic role in the early coding race was to develop a beautiful assay system that accelerated getting most of the codons beyond that for phenylalanine, a gigantic step and one that took (Marshall W.) Nirenberg to Stockholm. —THORU PEDERSON, UNIVERSITY OF MASSACHUSETTS MEDICAL SCHOOL

Surviving a bioscience Ph.D., March 2012

This article makes many great points many… I wish I had read while I was in graduate school. In particular, it is critical to realize whether you are a person that requires a hands-on guided adviser or one that prefers and works well with full independence. —ANONYMOUS

Mass Spectrometry Internal Standards



Whatever your Mass Spectrometry method - you still need an Avanti Standard

Avanti Polar Lipids, Inc. is the licensed manufacturer of mass spectrometry lipid standards for The LIPID MAPS Initiative in Lipodomics.

Phosphatidylinositolphosphates
Glycerophospholipids
Neutral Lipids
Saccharolipid
Sphingolipids
Prenols
Sterols

LIPID MAPS™

Avanti® LIPODOMICS DIVISION

Avanti® is the World's first choice for -

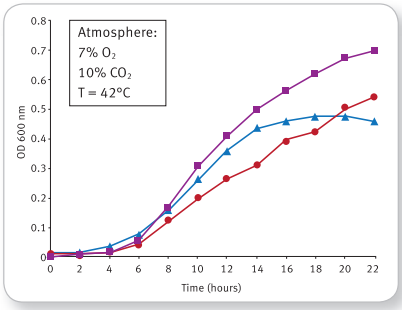
- **Phospholipids, Sphingolipids, Detergents & Sterols**
- **cGMP Lipids for Pharmaceutical Production**
- **Lipid Analysis**

Visit avantilipids.com

... with the POLARstar Omega microplate reader and the unique Atmospheric Control Unit (ACU).

With its independent control of O_2 and CO_2, the POLARstar Omega microplate reader with integrated ACU represents a true „walk away" solution for long term cell based assays.

- Tandem Technology
- UV/Vis Absorbance Spectra (220-1000 nm)
- Fluorescence Intensity incl. FRET
- Fluorescence Polarization
- TRF, TR-FRET incl. HTRF® and LanthaScreen®
- Luminescence (flash and glow)
- AlphaScreen®/AlphaLISA®
- ACU – regulate O_2 (1-19%) and CO_2 (0-20%)



Growth curve of three Campylobacter strains using the POLARstar Omega with the unique Atmospheric Control Unit.

For more information scan the QR code below with your smart phone or visit us on **www.bmglabtech.com**

BMG LABTECH

The Microplate Reader Company