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AMERICAN SOCIETY FOR BIOCHEMISTRY AND MOLECULAR BIOLOGY

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The Welch Foundation Chemistry Research & Texas

Proteomic Solutions in Cellular and Developmental Biology and Medicine

Stowers Institute For Medical Research
Kansas City, Missouri
May 2–4, 2003

Sponsored by the
ASBMB
and the
Stowers Institute for Medical Research

Organized by:
Joan W. Conaway, Stowers Institute
Ralph A. Bradshaw, UC, Irvine
John Walker, Univ. of Missouri, Columbia
Steve Alexander, Univ. of Missouri, Columbia

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Meeting website: http://www.asbmb.org/meetings

See page 2 for more information on this meeting

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ASBMB Today

AMERICAN SOCIETY FOR BIOCHEMISTRY AND MOLECULAR BIOLOGY

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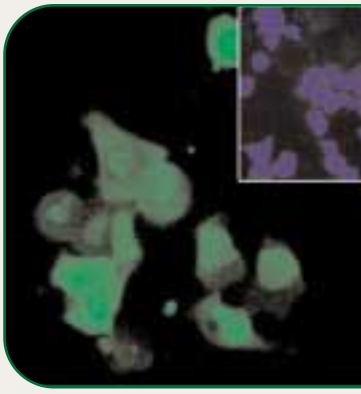

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Comments

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Moving Beyond Technology: Proteomic Solutions in Cellular

The field of proteomics has emerged in the post-genomic era as one of the most rapidly growing and exciting new areas of biological research. It has the capacity of identifying the molecular components of organelles and other subcellular structures as well as understanding the myriad of post-translational modifications that control cellular regulatory pathways. Although the "proteomic era" is only beginning, these studies are already producing exciting advances in cell and developmental biology as well as medicine.

For researchers who need to keep up-to-date on these developments, ASBMB and the Stowers Institute for Medical Research are jointly sponsoring a meeting, Proteomic Solutions in Cellular and Developmental Biology and Medicine, May 2-4, at the Stowers Institute in Kansas City, Missouri.

Many recent proteomics meetings have focused in large part on developing technologies for protein separation, analysis of composition and post-translational modifications, and analysis of protein-protein interactions. By applying these new technologies, researchers hope to be able to gain insights into how the myriad of proteins in cells and organisms function together as integrated systems. An important challenge is to devise strategies for the effective application of the vast amounts of data generated in proteomic analyses to the understanding of biological pathways and systems and how they contribute to human disease.

"The goal of this meeting," said Joan Conaway, Senior Scientist at the Stowers Institute for Medical Research and one of the meeting organizers, "is to move beyond technology by promoting discussion of how best to use proteomic approaches to address biological problems, and to analyze the data from proteomic analyses and effectively integrate it with results of more traditional 'hypothesis-driven' research."

"This timely meeting promises to reveal the exciting progress in biology and medicine that has resulted from the proteomics revolution of the past few years," said Stephen Alexander, Professor, Division of Biological Science, University of Missouri, Columbia, a member of the team that planned the meeting.

"The Stowers meeting was created to meet the varied interests of the Society and provide an opportunity to discuss proteomics at a small meeting with multiple purposes," said Ralph Bradshaw, Professor, Department of Physiology and Biophysics, University of California-Irvine, one of the meeting organizers and Editor of ASBMB's new journal, *Molecular and Cellular Proteomics*. "We wanted to do something not being done by others, we wanted to fashion a meeting based on specific issues and applications. This meeting can be seen as part of a larger fabric of small, focused meetings in the general fabric of proteomics.

"This meeting," he added, "also meets the need of a more local audience, and is an opportunity for grad students and postdocs from the Midwest in particular to meet with the best and get some of their work displayed."

The Stowers Institute has outstanding conference facilities, including a 230-seat auditorium, smaller meeting and conference rooms, space for poster sessions, dining facilities, and on-site guest suites for speakers. Situated in an area of parks and fountains, the Institute is a few blocks from the neo-classic Nelson-Atkins Museum of Art and the Country Club Plaza, a vibrant shopping, dining, and entertainment neighborhood.

and Developmental Biology and Medicine

Preliminary Program

May 2-4, 2003
Stowers Institute for Medical Research
Kansas City, Missouri

The meeting will begin Friday, May 2 in the evening and end by noon on Sunday, May 4. Additional speakers for oral sessions will be selected from the abstracts submitted. Students, postdoctoral fellows, and younger faculty are particularly encouraged to submit a paper for presentation in these sessions. Those who are selected to make oral presentations will also be encouraged to present a poster.

Keynote Lecture:

Richard A. Young, Whitehead Institute for Biomedical Research

Proteomic Solutions in Cell Biology—Organelle Structure and Function and Signaling Pathways

Chair, Steve Alexander, University of Missouri, Columbia
Michael Rexach, Stanford University
John J.M. Bergeron, McGill University

Proteomic Solutions in Developmental Biology

Chair, A.J. Marian Walhout, Dana Farber Cancer Institute
Michael Washburn, Torrey Mesa Research Institute
Richard D. Cummings, Univ. of Oklahoma Hlth. Sci. Ctr.

Proteomic Solutions in Medicine

Chair, John Kessler, Northwestern University
Hubert Hondermarck, Universite des Sciences et Technologies de Lille, France
Samir Hanash, Univ. of Michigan Med. Sch.

Tentative Meeting Schedule:

Friday, May 2
6:00 - 8:00 p.m.- Registration/Check-in
6:30 p.m.- Reception
8:00 p.m.- Opening Lecture and Welcome

Saturday, May 3
7:30 a.m.- 9:00 a.m.- Continental Breakfast
9:00 a.m.- 12:00 p.m.- Oral Session
12:00 p.m.- 2:00 p.m.- Lunch/Poster Presentations
2:00 p.m.- Keynote Lecture
3:00 p.m.- 6:00 p.m.- Oral Session

Sunday, May 4
7:30 a.m.- 9:00 a.m.- Continental Breakfast
9:00 a.m.- 12:00 p.m.- Oral Session

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HOTEL RESERVATIONS—DEADLINE: April 2, 2003

Hotel reservations should be made by Wednesday, April 2 in order to receive the discounted meeting rate. Room blocks are currently being held at the Fairmont Kansas City at the Plaza. Participants should contact the hotel directly to make their housing reservations. Be certain to mention the ASBMB/Stowers Meeting to receive the room rates below.

Fairmont Kansas City at the Plaza
401 Ward Parkway
Kansas City, Missouri 64112 USA

Global Reservations Center
1-800-441-1414
Fairmont Kansas City Reservations
Department - 816-756-1500

Room Rates:
King: $129.00 per night plus taxes
Double: $139.00 per night plus taxes

SUBMISSION OF ABSTRACTS—DEADLINE: March 19, 2003

Membership in the ASBMB is not required for submission of an abstract. Speakers for oral sessions will be selected from the abstracts submitted. Students, postdoctoral fellows, and younger faculty are encouraged to submit a paper for presentation in these sessions.

Abstracts must be submitted electronically. There is no abstract submission fee. Early submission is encouraged. Participants may submit more than one abstract. Abstracts will be published in a meeting program to be provided on site.

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The Welch Foundation
Devoted to Chemistry Research

By John D. Thompson, Editor

One of the oldest and largest private sources funding basic research in chemistry, the Robert A. Welch Foundation has, since its founding in 1954, become one of the United States' oldest and largest private funding sources for chemistry, biochemistry, and chemical engineering research, providing $469 million in research and departmental grants, university chairs, scholarships, lectureships, special projects and awards. The foundation is unique in that it is the only foundation in the nation that provides funding for chemical research in just one state—Texas.

Norman Hackerman, a former president of both Rice University and the University of Texas and the longtime chairman of the Foundation's Scientific Advisory Board, summarized the institution's uniqueness in his response to some questions posed by *ASBMB Today*.

ASBMB Today: The Welch Foundation is to our knowledge the only foundation that supports chemical research in a given state, Texas. In your own words, how do you see this as benefiting industry and research institutions in the state?

Dr. Hackerman: Welch grants are provided to support research into how nature functions in the area of its activities humans label as chemistry. By this means we hope to improve our understanding of how chemical processes occur and how they can be controlled. It is expected that such a capacity can be helpful but that is not a specific objective.

ASBMB Today: Have the foundation and its grants been a factor in attracting a large number of outstanding investigators to Texas?and keeping them in the state?

Dr. Hackerman: The effect of this support on academic research institutions in this state has been notable. It has helped bring and hold hundreds of faculty and thousands of students in chemistry, biochemistry, and chemical engineering. Also, while the effect of other forces cannot be fully dissected, this support has also contributed notably to the growth of chemical science and technology in Texas since the mid-twentieth century. This statement includes both quality and quantity. It is clear to scientists and engineers, here and elsewhere, that The Welch Foundation has been a significant factor.

Scientific Advisory Board Chairman Norman Hackerman

ASBMB Today: What are your hopes for the foundation and for chemical research in Texas?

Dr. Hackerman: Inevitably the future is at best fuzzy. However the changes due to increased interdisciplinary capabilities must lend to a broadening of the area chemistry covers. Nature is unaware of fields of science, the latter being a 'human invention' for convenience. However, our understanding of nature grows. Nonetheless, what we call chemical processes will remain identifiable and we will be able to continue to discern the somewhat fuzzier boundaries of the future. With that as a fact, the Foundation's activities for a reasonably discernible future are assured.

Reflecting on the Foundation's accomplishments in its 2002 Annual Report, Chairman Richard J.V. Johnson said, "I am struck by how much the field of chemistry research has grown since the Foundation was first established, from increases in governmental and private funding to new investigative methods that make it possible to explore complex questions more effectively. As research and discovery occur at a faster pace, scientists are using more interdisciplinary approaches to solve complex problems. Yet basic research in chemistry remains fundamental to developing this broader understanding of our universe, and it is clear that the need for support in this area remains."

The Foundation's endeavors include an annual chemistry conference; the Norman Hackerman Award in Chemical Research to recognize a "rising star" young scientist; grants to chemistry departments at small and medium-sized educational institutions in the state; and funding of 41 academic chairs in chemistry. The Foundation also provides support at Texas universities for a lecture series by prominent visiting chemists, a summer scholar research program for high school students, and a biennial conference for high school chemistry teachers.

Foundation Chairman Richard J.V. Johnson

Scientific Advisory Board

The Scientific Advisory Board chaired by Dr. Norman Hackerman is comprised of nine of the world's most renowned leaders in chemistry and related sciences, including five Nobel Laureates. This group plays a key role in the Foundation's mission, advising the board of directors on scientific issues, evaluating proposals for

And the State of Texas

research grants, and reviewing all nominations for the Welch Award in Chemistry. In addition, the board helps oversee the foundation's visiting lecture series, departmental grants, and other programs.

Nobelists on the Scientific Advisory Board are:

Elias J. Corey, Professor of Chemistry at Harvard, who received the Nobel Prize for Chemistry in 1990.

Nobelist Joseph Goldstein

Joseph L. Goldstein and **Michael S. Brown** the 1985, ASBMB members who shared the Nobel Prize in Physiology or Medicine for discoveries related to cholesterol metabolism. Dr. Goldstein is Chairman of the Department of Molecular Genetics at the University of Texas Southwestern Medical Center, Dallas.

Yuan T. Lee, a recipient of the Nobel for Chemistry in 1986. Dr. Lee is President of Academia Sinica, Taipei, Taiwan.

ASBMB member **William N. Lipscomb, Jr.**, Professor of Chemistry Emeritus, Harvard University, who was awarded the Nobel for Chemistry in 1976.

Ahmed H. Zewail, the Linus Pauling Chair and Professor of Chemistry and Physics, California Institute of Technology, who was awarded the Nobel for Chemistry in 1999.

Other members of this board are ASBMB member **Peter B. Dervan**, Professor of Chemistry, California Institute of Technology; **Marye Anne Fox**, Chancellor, North Carolina State University; and **Peter G. Schultz**, Professor of Chemistry, The Scripps Research Institute.

Awards Recognize Scientific Achievements

The Welch Foundation recognizes exceptional scientific achievement with two awards. The Welch Award in Chemistry, which includes a $300,000 prize and a gold medallion, is presented each year to an individual who has made lifetime contributions to science through basic research in chemistry. The $100,000 Norman Hackerman Award is made on an annual basis, when warranted, to a younger scientist conducting chemical research in Texas. This award is meant not only to recognize the scientist's work, but is also intended as encouragement to those embarking on careers dedicated to increasing our fundamental understanding of chemistry.

As a result of his pioneering work in understanding the fundamental molecular properties of cell membranes, including those related to the regulation of cholesterol and the activation of the body's immune system, Stanford University's Harden M. McConnell, an ASBMB member, was selected to receive the 2002 Welch Award in Chemistry.

Dr. McConnell, Robert Eckles Swain Professor of Chemistry Emeritus at Stanford University, was recognized for significant discoveries in basic science which he has more recently related to cellular behavior at the molecular level. His research has increased our understanding of the interactions between cholesterol and the fatty acid chains of phospholipids, as well as the reactions between proteins and peptides by which the body activates its immune system.

"These discoveries set the stage for further research that will bring new insights into immune surveillance and in understanding the function of cholesterol in cells," said Welch Foundation Chairman Johnson.

Welch Award Recipient Harden M. McConnell

"Dr. McConnell has made a series of pioneering discoveries concerning the physical state of liquid membranes, providing principles used every day by many scientists," said Dr. Hackerman. "His combination of physical chemistry and biology has immediate relevance to contemporary research on cell membranes."

Designed to recognize and encourage young chemists in Texas, the inaugural Norman Hackerman Award in Chemical Research was awarded to Andrew R. Barron in 2002. Dr. Barron is the Charles W. Duncan, Jr. – Welch Chair in Chemistry and Professor of Materials Science at Rice University.

Dr. Barron specializes in the chemistry and materials science of aluminum and its related elements. Research initiatives encompass problems across the fields of traditional inorganic chemistry, organometallic chemistry, nanoscale science and technology, and materials science. His research covers the continuum from synthesis to application. On the application side, Dr. Barron is especially interested in the development of new materials and the fabrication of micro- and nano-electronic devices based on molecular design.

He has developed a new way to make aluminum-oxide ceramics that is more environmentally sensitive, as well as composite materials enhanced by nanotechnology. In collaboration with Mark Wiesner, Rice Professor of Civil, Environmental and Chemical Engineering, he also created a nano filter system

The Welch Foundation

that could be used in hazardous waste treatment, biomedical separations, and to control the spread of viruses.

Quantum Chemistry Takes Center Stage at Welch Chemical Research Conference

Recent developments in computer technology and sophisticated theory have dramatically increased the scope and power of quantum chemistry and its ability to shed light on complex chemical problems. More than 400 scientists from around the world convened in Houston last October to further explore these capabilities at The Welch Foundation's 46th Conference on Chemical Research, "Advances in Quantum Chemistry."

"It was exciting to see so many excellent quantum chemists gather together and discuss this subject," said conference chairman Yuan T. Lee, "Chemistry has long been an experimental science, but these new tools provide a foundation for analytical approaches to very complex problems."

The 2003 Welch Conference on Chemical Research, "Chemistry in Texas: Fifty Years of The Welch Foundation," will be held October 27-28 at the Wyndham Greenspoint Hotel in Houston.

Welch Programs Enrich Chemical Research, Education

Research Grants

In 2002, the Foundation awarded $19.3 million in grants to 126 researchers?renewing support for 106 projects and funding 20 new proposals. Currently, 452 principal investigators receive Welch funding, bringing total Foundation support for chemical research to $469 million since 1954. Each research grant is renewable based on a proposal and provides a minimum of $150,000 over three years.

Departmental Grants

In the past year, 40 chemistry departments at small- and medium-sized Texas educational institutions received Welch department grants. These grants fund scholarships and provide lab equipment and supplies for faculty and student research. By providing students with first-hand experience in basic research and the opportunity to participate in industry meetings and conferences, the Foundation hopes to further their interest in chemistry.

Welch Chairs

In addition to providing departmental grants, the Foundation currently endows 41 chairs in chemistry at 20 Texas institutions. These chaired positions attract some of the world's most renowned names in science, enhancing chemical research and education statewide.

Visiting Lecture Series

Each year, students and faculty at various Texas colleges and universities enhance their chemistry studies by attending a visiting lecture series hosted by The Welch Foundation. These lectures feature some of the best scientific minds in the world sharing their insight and knowledge about various areas of chemistry. For the 2001-2002 academic year, eight scientists made presentations at 24 universities across Texas.

Summer Scholar Program

The Welch Summer Scholar Program has for the past 18 years provided high school students the opportunity to work with faculty researchers in their laboratories at Texas university campuses for five weeks.

This first-hand experience not only teaches students a great deal about chemistry, but exposes them to new education and career options. Many participants are motivated to pursue education beyond high school, often continuing their work in science and chemistry.

In addition to in-lab work, students gain exposure to a guest speaker series, tours of chemistry-based research facilities, assignment to an ongoing research group, the presentation of personal research findings, and life on a typical university campus. The common laboratory experience is conducted during the first week of the program and is designed to give students the expectations of a university-level laboratory experience. Experiments have included inorganic synthesis and analysis, organic synthesis and analysis and spectrometric methods of analysis.

Last summer, 53 Texas high school students took part in the Summer Scholar Program at the University of Texas campuses in Arlington, Austin, and Dallas, and at Texas Tech University and the University of Houston.

Teacher Program

An important consideration for precollege chemistry teaching is the continuing education of teachers. The Welch Foundation, recognizing the importance of a teacher's role in fostering student interest in the sciences, has supported several activities initiated by the Associated Chemistry Teachers of Texas.

In 2002, the Foundation supported a workshop held at Texas Wesleyan University. Forty-three high school teachers (31 from Texas) participated in this intense workshop, which is specifically tailored to the needs of high school and junior high school chemistry and science. The workshop focused on enhancing the teacher's

knowledge of using chemical demonstrations, participation in hands-on laboratory activities, and meeting National Education Science Standards for chemistry.

The Welch Legacy

The Welch Foundation is a legacy to the world from Robert Alonzo Welch, a self-made man with a strong sense of responsibility to humankind, an enthusiastic respect for chemistry and a deep love for the state of Texas.

Born in South Carolina to a prominent family that fell on hard economic times, Mr. Welch came to Houston as a youth and later made his fortune in oil and minerals. Over the course of his career and life, he became convinced that the pursuit of chemistry and chemical research held great potential for vast good and would continue to have a valuable impact on business, industry, global leadership and the human condition.

In his will, Welch stated, "I have long been impressed with the great possibilities for the betterment of mankind that lay in the field of research in the domain of chemistry." With his death in 1952, he left a generous portion of his estate to his employees and their families. The balance began what is now The Welch Foundation.

The Welch Foundation's Impact on Research in Texas

by Dr. Robert D. Wells, Past President of ASBMB and President-Elect of FASEB.

The Robert A. Welch Foundation has had a profound impact on the quality of research in chemistry in Texas. The Welch Foundation supports several types of programs including Endowed Chairs for distinguished faculty, research grants for scientists at Texas institutions in chemistry, chemical engineering, and biochemistry as well as sponsoring the annual Welch Award.

The Robert A. Welch Endowed Chair in Chemistry at the Institute of Biosciences and Technology, which I hold, was a major factor in attracting me to move to Texas in 1990, and has certainly been a positive factor in my retention since resigning the Institute Directorship in 1994. The Welch Foundation provides Endowed Chairs to judiciously chosen institutions who then identify an excellent scientist for recruitment, generally outside the state of Texas. Thus, this mechanism has served an important role in strengthening chemically related research within the state. In addition to the Welch Endowed Chairs, the Foundation has provided almost $500 million in chemical research grants to 69 Texas institutions since the mid 1950s. In 2001, it contributed over $22 million in research grants to 135 researchers. Thus, these funds may be used for salaries, equipment, supplies, travel, etc., and, therefore, serve as a wonderful contribution to research programs that are otherwise adequately funded.

Robert D. Wells

The Robert A. Welch Award and the Annual Meeting are highlights of the Texas chemical academic year and a large number of members of the ASBMB have been recognized by this fine award (discussed above).

To the best of my knowledge, this is the sole foundation in the U.S. that provides funds for chemical research in a single state.

In summary, the impact of the Robert A. Welch Foundation on the quality of chemical research in Texas has been enormous.

The research supported by the Foundation in my laboratory focuses on the biochemical properties of long triplet repeats of GAA•TTC which are involved in the etiology of a devastating hereditary neurological disease named Friedreich's ataxia. A major discovery over the past 10 years has been the genetic expansion of simple triplet repeat sequences (CTG•CAG, CGG•CCG, and GAA•TTC) for the indicated diseases. Normal individuals have short repeat sequences whereas patients contain greatly expanded triplet repeat tracts. The processes of replication, DNA repair, and recombination mediate these expansions and deletions are the major focus of my laboratory. In addition, we are quite interested in the chemistry of the DNA conformations adopted by these sequences, especially the GAA•TTC tract in Friedreich's ataxia which forms a long three-stranded structure (triplex) named sticky DNA. Sticky DNA is a novel conformation found in Friedreich's ataxia sequences that causes two segments of DNA to tightly adhere to each other. Our present emphasis is in addressing the physiological functions of this unusual DNA structure in the disease etiology.

The Welch Foundation
A Source of Stability

by Dr. Bettie Sue Masters, ASBMB President.

Soon after I began my independent career as an Assistant Professor at the University of Texas Southwestern Medical School, I received a research grant from The Robert A. Welch Foundation. The Biochemistry Department at Southwestern was the only one in the institution privileged at that time to be granted such awards due to our chemical heritage. Robert A. Welch, after all, had endowed research in chemistry only in the state of Texas in his will. This award meant that we could hire a postdoctoral fellow and support a graduate student or an undergraduate research scholar or it could be used to bolster our funding levels to make it possible to fund an extra item of equipment or simply to provide some stability to our laboratory enterprises when other sources fluctuated.

Multitasking with papers under her arm and headset on for teleconferencing is Bettie Sue Masters, Robert Welch Foundation Professor of Chemistry at the University of Texas Health Science Center in San Antonio. With her are Laboratory Director and Senior Research Associate Tom Shea, in suspenders, and Pavel Martasek, M.D., Ph.D. The latter, said Dr. Masters, "is pointing to the flasks to guide my hands. My lab colleagues are always fearful when they see me in lab mode—a little rusty."

In the 1970's, the Robert A. Welch Foundation Chairs in Chemistry were established. This offered certain institutions that received Welch grant funding the opportunity to recruit outstanding research investigators from out of state to their respective campuses with generous endowments. I was a member of the committee to select such an individual in Dallas but the mission was not accomplished before I left to become Chair of Biochemistry at the Medical College of Wisconsin in 1982. It never occurred to me that I would become a recipient of one of these endowments some 8 years later. In 1990, I was recruited from Wisconsin to become the first Robert A. Welch Chair in Chemistry in the Department of Biochemistry at the University of Texas Health Science Center in San Antonio. The decision to assume that position has been one of the most positive of my life. With these supplemental funds, it was possible for me to embark upon an entirely new area of research involving studies of the various isoforms of nitric oxide synthase after having spent most of my experimental life in research on NADPH-cytochrome P450 reductase and a subfamily of cytochromes P450 catalyzing fatty acid and prostaglandin oxygenation. Without these additional resources, it would not have been possible to begin this entirely new research program.

During the years I have been eligible for Welch funding, as a faculty member of a Texas academic institution, I have received continuous support from The Robert A. Welch Foundation. Many of my colleagues in other states have been envious of this opportunity as they see it as a stability factor and an alternative support mechanism for the training of students and postdoctoral fellows. I have been honored and blessed by the largesse of this remarkable foundation.

ASBMB Member Receives Kyoto Prize

Dr. Leroy Hood, President of the Institute for Systems Biology, Seattle, was presented with the Kyoto Prize for advanced technology in the field of Biotechnology and Medical Technology. Dr. Hood received the award at a special ceremony last November in Kyoto, Japan, and delivered his laureate presentation in March at the Second Annual Kyoto Laureate Symposium at the University of San Diego.

The Kyoto Prize recognized Dr. Hood's "outstanding contribution to life sciences through the development of automated instruments for the determination of protein and DNA sequences and their syntheses." He developed an automated peptide sequencer approximately 100 times more sensitive than previous instruments, as well as automated peptide and DNA synthesizers and an automated fluorescence DNA sequencer. Through these achievements, he has made a substantial contribution to progress in life science and today's advances in human genome science.

Dr. Hood conceived and realized the use of automated instruments in molecular biology and molecular genetics, fields which had hitherto depended primarily on the technical prowess of scientists. Through such innovations, he helped complete the sequencing of the human genome, an extraordinary contribution to the advancement of life science and one that had initially been predicted to take nearly a century to accomplish.

In the 1970s, scientists made important steps in the field of genetic engineering, foremost among which were DNA fragmentation and cloning and the subsequent technology of DNA sequencing. Such methods, however, required considerable time and skill on the part of scientists. Dr. Hood developed a high-speed, highly-sensitive peptide sequencer, making it possible to automatically determine the amino acid sequence of amino acids within proteins, key components of the human body. The dramatically increased sensitivity of this sequencer, which employed phase-based coupling and cleavage steps, allowed scientists for the first time to analyze trace proteins in living organisms.

In 1984, Dr. Hood pioneered an automated peptide synthesizer and an automated DNA synthesizer. The latter technology contributed to the rapid diffusion of PCR (Polymerase Chain Reaction), a DNA amplification technique developed around the same time. These important innovations facilitated and stimulated the subsequent remarkable progress in all areas of DNA and protein research. In 1986, he announced the world's first automated fluorescent DNA sequencer, a groundbreaking invention that made the deciphering of three billion genetic codes an attainable goal. This automation drastically reduced the time required for sequence determination and formed the prototype for the capillary DNA sequencer widely used today.

Kyoto Prize Winner Leroy Hood

A working draft of the entire human genome sequence was published in 2001 and the complete sequence will be published later this year. This rapid advancement of the Human Genome Project was made possible in large part by Dr. Hood's DNA synthesizer and sequencer.

The progress and achievements of genomics are expected to lead to revolutionary new medical applications, such as the development of powerful DNA diagnostics methods for predictive medicine. specification of optimal methods of treatment for individuals. In addition, the deciphering of genetic information for other species will undoubtedly facilitate the development of solutions for the food crisis and environmental problems as well as provide important insights into the history of life evolution. The various high-speed, automated instruments pioneered by Dr. Hood have been fundamental to progress in genomic science and modern biology.

ASBMB Welcomes New Ph.D.s

ASBMB extends its congratulations to these individuals who recently received their Ph.D. degrees. In recognition of their achievement, ASBMB is presenting them with a free one-year membership in the Society. The new Ph.D.s are listed below with the institution from which they received their degree.

Dayle K. Blencowe
Cardiff University School of Biosciences
Steven M. Claypool
Harvard University
Amy L. Haas
Harvard University
Christina A. Johnson
University of California, San Diego
Andrew W. Kinley
University of Virginia
Zhiqiang Lu
University of Arkansas
Michael A. A. Mathews
University of Utah
Jalil Mehrzag
Ghent University
Steven C. Pohnert
Duke University
Xinye Yin
University of Texas Health Science Center

NIH 'Hits Wall' in President's 2004 Budget Request

By Peter Farnham, Public Affairs Officer

The Administration has proposed a 2% increase for NIH in the federal budget for fiscal year 2004. The NIH budget would increase $549 million, to almost $27.9 billion. While the proposed increase is considerably larger than the 0.2% increase floated as a trial balloon late last year, it is still a disappointing (but not unexpected) proposal after almost five years of multi-billion dollar increases in connection with the NIH doubling campaign begun in 1999.

In an unusual sequence of events, the President's budget for fiscal 2004 was made public about 10 days before the fiscal 2003 budget was finalized. However, the President's 2004 proposals for all unfunded agencies were based on his FY 2003 budget proposals made a year ago. The President had proposed that NIH receive a 15% increase in 2003; his 2004 proposal was based on the assumption that Congress would complete the doubling of the NIH budget in fiscal 2003, which it did just before Valentine's Day. Thus, the increase for NIH in the President's 2004 proposal does not need to be recalculated, as it does for many other agencies the budgets for which did not increase at the rate proposed in his 2003 budget (see the discussion of the 2003 budgets for NIH and NSF in the accompanying sidebar).

While the President's 2004 proposal calls for only a 2% increase overall, there have been shifts within the budget from last year to this to keep research project grants growing at a more robust pace. For example, the 2003 budget included almost $1.4 billion in facilities construction (on and off the NIH campus) and anthrax vaccine procurement. These one-time costs were paid for last year and funds in the 2004 budget have been reallocated to support research, expenditures for which grow by 7.5% in the new budget.

However, these additional research expenditures are targeted. A total of 322 new and competing grants are fully funded in 2004, for over $179 million.

"The proposed 2% increase for the 2004 budget is disappointing, and marks the beginning of an erosion of NIH's research capacity..."

—Bettie Sue Masters, ASBMB President

In addition, the number of biodefense-related research grants has doubled from last year, to 661. The number of new and competing grants that are not biodefense-related rises only slightly—9,848 in 2004, a gain of just 19. The size of grants will also increase slightly—competing renewal grants will be up about 1%, and noncompeting grants 2.7%. In short, nonbiodefense-related research expenditures rise at only about a 4% rate in the budget proposal.

In his January 28 State of the Union, President Bush noted that the skill and innovation of American medicine generates "a pace of discovery that is adding good years to our lives." However, a 2% increase at NIH fails to recognize those factors required to ensure continued progress toward better health and improved quality of life. These include maintaining current research efforts, producing new ideas, and the development of technologies needed to sustain medical progress.

While biomedical researchers expressed gratitude to the President for his strong support of the doubling campaign (which is slated to end in FY 2003), the new proposal falls well short of the 8% to 10% increase most observers believe NIH needs to maintain biomedical research at some reasonable level. ASBMB, along with FASEB, the Ad Hoc Group for Medical Research Funding, and most other biomedical research advocacy groups, is supporting a 10% increase in NIH funding for 2004.

Of the NIH budget proposal, ASBMB President Bettie Sue Masters said, "We are grateful to the President for his long-standing support for doubling the NIH budget and are pleased that his proposal assumes that Congress will complete the doubling on time. However, the proposed 2% increase for the 2004 budget is disappointing, and marks the beginning of an erosion of NIH's research capacity just at the point when the doubling has been largely completed. Several years of such increases would largely eliminate the effect of the generous appropriations supported by two Presidents and large bipartisan majorities in Congress

since 1998. It is even more imperative in this time of uncertainty that the very underpinnings of the health of U.S. citizens be maintained over an extended period at a level that will sustain the progress that has been made, albeit somewhat less than during the doubling years. This cannot be done with an increase of merely 2% as compared to 13% to15%. Therefore, ASBMB and most of the biomedical research community are supporting an increase for NIH of approximately 10% in the 2004 budget in order to sustain the magnificent research engine that has been created at NIH."

A detailed document laying out the President's 2004 proposal for NIH is available on the NIH website, at http://www.nih.gov/news/budgetfy2004/fy2004presidentsbudget.pdf

NSF Fares Little Better

Regarding NSF, the President asked for a 9% increase to $5.48 billion in 2004. This is about $450 million above the Administration's request of $5.03 billion for the agency in fiscal 2003. However, Congress approved on February 13 a $5.3 billion budget for NSF for 2003, so the President's request for 2004 has already been overtaken by events. Taking into account the 2003 appropriation, the President's proposal amounts to a 3.2% increase, not a 9% increase (see accompanying sidebar for more detail).

The agency's core research programs are up slightly over 2003, with Research and Related Activities increasing by 1.2% to $4.1 billion of NSF's total. Extra emphasis is placed this year in the area of mathematics and physical sciences. For the first time, the research programs in this area collectively amount to more than $1 billion. The Biological Sciences Directorate (BIO) actually shrinks under the President's proposal; he proposed a total of $562 million for BIO, but Congress had already approved $571 million for BIO in 2003.

NSF continues to work toward increasing the size and duration of its research grants, and has adopted the goal of average NSF grants amounting to $250,000 per year for five years. Although it has a long way to go to reach that goal, slow progress continues this year. The average grant in 2004 is expected to be $128,000.

In addition to core research programs, NSF is supporting significant work in six priority areas: Biocomplexity in the Environment ($99.8 million); Information Technology Research ($302.6 million); Nanoscale Science and Engineering ($249 million); Mathematical Sciences ($89 million); Human and Social Dynamics ($24.2 million); and a Workforce for the 21st Century initiative ($8.5 million).

Funding will also be targeted toward homeland security research, research on climate change, and the establishment of three to five centers to focus on the science of learning.

More detailed information on the NSF budget proposal for 2004 can be found on its website, at: http://www.nsf.gov/home/budget/start.htm

2003 Appropriations Clear Congress; NIH Completes 5-Year Doubling Campaign

The 2003 appropriations process is finally complete (although well over four months behind schedule). House, Senate, and White House negotiators hammered out a 2003 omnibus spending bill in early February that was approved by both House and Senate on February 13 and sent to the President for his signature.

In even better news, the National Institutes of Health budget will be officially doubled. In the agreement, NIH receives almost $3.8 billion in additional money over the 2002 level—a 15% increase that puts it at $27.2 billion. However, once various taps, salary cuts and other allocations are taken into account, the effective program budget for NIH is about $26.4 billion. These reductions include $100 million for global AIDS; $176 million to cover a 0.65% across-the-board cut in all agencies in the omnibus bill; and $507 million for a "program evaluation" tap (largely a transfer to other HHS agencies such as the Agency for Healthcare Research and Quality). On the other hand, $74 million is transferred from EPA for research at the National Institute of Environmental Health Sciences.

PAAC Chair Bill Brinkley said upon hearing the news, "We all can declare victory on this remarkable five-year campaign. The bill is not expected to have any changes when it goes to Congress for signature and to the President's desk. Victory at last! Kudos to our champions on the Hill and all who worked to make this possible."

The National Science Foundation also fares well. NSF receives an 11.6% increase in the omnibus bill, with the Foundation's research programs rising 13.5%. Last September, when an NSF appropriation bill finally began to move in the Senate, ASBMB President Bettie Sue Masters wrote to Senators Mikulski and Bond expressing concern about the disparity between what had been proposed for most of the research programs at NSF (in the double-digits on a percentage basis) and the biological sciences directorate (about 3.5%). That disparity has been eliminated; BIO gets a 13.1% increase, the same as the other research directorates.

Tables from NIH and NSF showing the fiscal 2003 appropriations are available for viewing on the public affairs page of the ASBMB website.

Purdue Researchers Discover

The biological clock—timekeeper for virtually every activity within living things, from sleep patterns to respiration—is a single protein, Purdue University researchers report.

The husband-and-wife team of D. James and Dorothy Morré has discovered this protein, which is responsible for setting the length of periods of activity and inactivity within cells. If the protein is altered, an organism's body will experience "days" of different length—ranging from 22 to 42 hours in length in some cases. The discovery, they believe, could have far-reaching implications for medicine.

"We can now begin to understand the complex chain of events that connect the clock to events in the body," said James Morré, an ASBMB member and Dow Distinguished Professor of Medicinal Chemistry in Purdue's School of Pharmacy and Pharmacal Sciences. "Since the clock affects nearly every bodily activity, this discovery holds myriad potential applications, from minimizing jet lag to determining when best to administer cancer drugs."

The research is the culmination of four decades of work and a lifelong fascination of Dr. James Morré.

"I first set out to find the source of the biological clock in 1962, when I was still a student," he said. "Back then the question was the subject of perennial and lively scientific debate. Theories abounded as to why the body was able to keep its own rhythm – some thought it was bound up in cellular chemistry, but others thought it could be influenced by anything from the lunar cycle to sunspots. No one could prove anything conclusively, though, so the physicists had a field day arguing about it."

The argument was more than just an intellectual exercise. Even in the early 1960s, scientists knew that cancer patients and the elderly often experienced disorders thought to be related to the biological clock. As time passed, it also became clear that astronauts suffered bone loss and muscle wastage due, in part, to space travel's effects on their internal clocks, and air travelers began experiencing the clock-related ailment of jet lag.

"We knew little for certain," he said. "But I always thought a better understanding of life's processes would result if we knew what made them tick."

One biological clue to the puzzle was discovered in the 1960s. Heavy water—water made of two atoms of deuterium, the isotope of hydrogen with an extra neutron in its nucleus—could alter the clock to run on a 27-hour day.

"Lots of heavy water was available back then, as it was needed for nuclear reactors," he said. "Investigators discovered that if you fed cells heavy water, they would operate on a 27-hour day. It was a clue that the clock had a biochemical basis, but heavy water's effect was almost forgotten as other explanations for the clock gained favor."

Forty years passed. Dr. Morré spent time on other projects, but the biological clock never escaped his mind or efforts completely. Then an examination of how cells grow led him to the discovery.

The Morrés found that cells increase in size at a periodic rate – they enlarge themselves for 12 minutes, then rest for 12 before growing again. The complex interaction of proteins is the basis for many activities within cells, and James Morré theorized that some undiscovered proteins were responsible for the 24-minute growth cycle.

The discovery came when the team found that a single cylinder-shaped protein molecule with a unique characteristic regulated the cell enlargement cycle. This particular protein had two activities: one served as a catalyst for growth activities for 12 minutes and then rested while its other activity took over for the next 12 minutes.

"Our model is that of a Janus-head protein with two opposing faces," he said. "One 'face' handles cell enlargement. Then the protein 'flips over,' allowing the second face to carry out other activities while cell enlargement rests. While two functions from a single protein had been seen before, what is totally unique here is that these activities alternate, and with very precise timing. The activities don't both run all the time, but instead alternate to generate the 24-minute period length."

To confirm that the protein was responsible not just for regulating growth but for all activities set by the biological clock, Pin-Ju Chueh, then a microbiology graduate student in Dr. Dorothy Morré's lab, isolated the gene which produced the protein within cells. The team then cloned the protein and altered it in ways that produced different period lengths.

"We found that we could produce clocks with cycles of between 22 and 42 minutes," Dr. James Morré said. "The 'day' which the cell experienced was precisely 60 times the

Basis For Biological Clock

period length of the protein's cycle. We even found that feeding cells heavy water gave them a 27-minute cycle of growth and rest, so that old piece of information served to confirm our theory."

He said the discovery could be applied to a great number of biological issues.

"Now we have an opportunity to tell how organisms tell time," said Dorothy Morré, an ASNS member and Professor of Foods and Nutrition in Purdue's School of Consumer and Family Sciences. "This could give us new insights into cellular activity, such as cholesterol synthesis, respiration, heart rhythms, response to drugs, sleep, alertness—there's so much."

While it is presently difficult to make the biological clock speed up or slow down, it can be reset, a fact which could assist the sleep-deprived.

"This discovery also affords an opportunity to improve our methods of clock setting, from minimizing jet lag to correcting sleep disorders," Dr. James Morré said. "We might even be able to develop simple artificial clock-setting environments to aid astronauts and those living near the Arctic Circle, where day-night cycles are absent for long periods."

While the research could be applied to many disorders, the newly discovered protein first needs further attention.

"It is very difficult to look at the protein," he said. "Usually with unknown proteins you can crystallize them and then examine them with a high-energy X-ray beam, but this one can't be crystallized because it's constantly moving. A better picture of the protein switching back and forth would greatly assist future practical applications of the discovery."

This research was sponsored in part by NASA, the National Institutes of Health and the Purdue Botanicals Center.

Dr. James Morré is a member of the Purdue Cancer Center, one of eight National Cancer Institute-designated basic-research cancer centers in the United States. Established in 1976, the center is committed to helping cancer patients by identifying new molecular targets and designing future agents and drugs for effectively detecting and treating cancer.

Both Morrés are members of the Purdue-UAB Botanicals Center, which in collaboration with the University of Alabama-Birmingham, promotes interdisciplinary botanicals research for the prevention of age-related diseases. The center has received support from the National Institutes of Health to study compounds in botanicals purported to reduce the risk of cancer, osteoporosis, cardiovascular disease, cognitive function and other age-related diseases. The Purdue-UAB Botanicals Center is one of four NIH-funded Botanicals Research Centers in the United States.

Purdue News Service Photo/David Umberger

D. James and Dorothy Morré in a Purdue University laboratory. The husband-and-wife team has discovered a protein that is responsible for setting the length of periods of activity and inactivity within cells in the body, acting as a biological clock. The research, which appears in the journal Biochemistry, is the culmination of four decades of work by James Morré.

Researchers Identify Protein

Researchers at Washington University School of Medicine in St. Louis have found that a protein called cytidine uridine guanosine binding protein-2 (CUGBP2) can destroy several different types of cancer cells. When the team inserted the protein into cultured tumor cells, more than 70 percent self-destructed.

The study appeared in the January 17 issue of the journal *Molecular Cell*. The researchers found that CUGBP2 helps regulate production of cyclooxygenase-2, (COX-2), which is better known as a key culprit in arthritis.

"The gene that produces COX-2 is turned on very early in cancer, so there has been a lot of research to see whether interfering with it might be an effective therapy," says principal investigator ASBMB member Shrikant Anant, Ph.D., Assistant Professor of Medicine in the Division of Gastroenterology and Research Member of the Siteman Cancer Center at Washington University School of Medicine and Barnes-Jewish Hospital in St. Louis.

In rheumatoid arthritis, COX-2 converts arachidonic acid in the body into prostaglandins. In cancer cells, COX-2 levels also rise and trigger production of prostaglandins. The prostaglandins bind to tumor cells and help turn on genes involved in the generation of new blood vessels, helping feed the cells' rapid growth.

In this study, Dr. Anant and colleagues looked at events early in the development of tumors. In any cell's life, there is a normal cycle of replication and division. First, a close copy of DNA, called RNA is made, and that RNA, in turn is translated into proteins. These proteins have to be made at precisely the right time in order for the cycle to work correctly. It is thought that tight regulation of important proteins is critical, and interfering with the strict regulation of these proteins even by a few minutes can lead to serious problems such as cancer.

That precise timing is controlled by the activity of messenger RNA (mRNA). Anant and colleagues explored the interaction of CUGBP2 with COX-2 mRNA in eight types of human cancer cells. In all eight, levels of CUGBP2 were very low.

"This suggests that an important step in the development of cancer is turning down the gene responsible for production of CUGBP2, thereby reducing CUGBP2 protein levels and allowing the cancer to flourish," Dr. Anant explains.

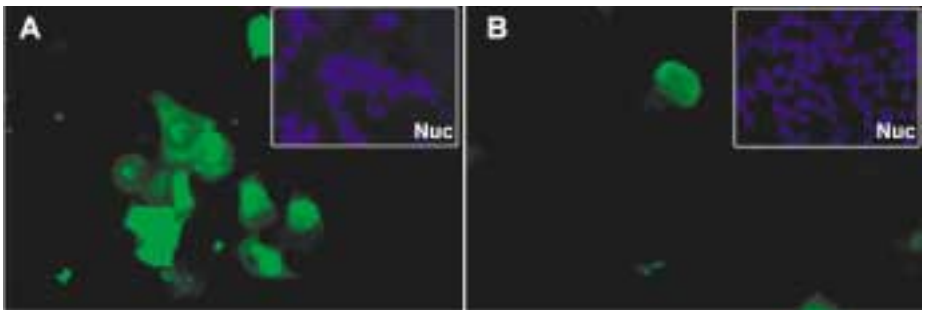
Dr. Shrikant Anant

The researchers also found that when CUGBP2 attached to mRNA from COX-2, cancer cells no longer could make COX-2, and they died. That suggested that CUGBP2 might play a central role in tumor cell survival or death.

"CUGBP2 may be one type of master switch used by the cell to control other key proteins," says co-author Brian K. Dieckgraefe, M.D., Ph.D., Assistant Professor of Medicine in the Division of Gastroenterology. "Proteins like COX-2 need to be tightly regulated to avoid uncontrolled growth. That may be why CUGBP2 levels were significantly lower in every single tumor we studied."

Dr. Anant, Dr. Dieckgraefe and colleagues also found that CUGBP2 was not toxic to healthy cells. Moreover, when they introduced CUGBP2 into cancer cells at the levels found in normal cells, the cancer cells died.

"When CUGBP2 is introduced, there are a number of molecular derangements that take place in the cancer cell that make it susceptible to death," Dr.



CUGBP2 inhibition results in decreased levels of radiation-induced apoptosis. Colon cancer cells in culture were transfected with either antisense CUGBP2 specific (A) or scrambled (B) oligonucleotide, and subsequently subjected to 12 Gy g-radiation. Apoptotic cells are shown by green fluorescence. Nuclear staining of the cells is shown in blue (inset).

That Kills Cancer Cells

Anant says. "In the future, it may be possible to use this protein as a means of killing tumor cells without harming normal cells because normal cells already produce significant amounts of the protein."

He already is looking at whether it is possible to use the protein in animal models of cancer to see whether it has the same effect in their tumors as it did in human cancer cells in the test tube. If these studies continue to demonstrate that it's possible to kill cancer cells by raising CUGBP2 levels, he believes the strategy might be ready for human testing in a few years.

Even if raising levels of CUGBP2 does not eliminate cancer, the researchers believe it may help existing therapies work better.

"Most therapeutic tools we currently use for cancer act by triggering cells to self-destruct," Dr. Dieckgraefe says. "So it's entirely possible that this might become a synergistic addition to existing therapies. By augmenting existing chemotherapy with CUGBP2, we might be able to make traditional therapies more effective."

In addition, the team says COX-2 might not be the only protein that CUGBP2 influences. Broad ranges of proteins have similar targets, so they believe CUGBP2 may have a role in regulating the production of those proteins, too.

Newly Identified Gut Protein Kills Bacteria

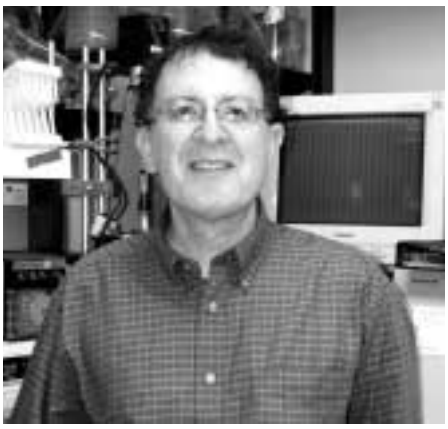
Researchers at Washington University School of Medicine in St. Louis have discovered a new antibiotic protein that appears to kill certain types of bacteria in the intestine. Their results are to be published this month in the journal *Nature Immunology*.

"These findings were completely unexpected," says Lora V. Hooper, Ph.D., Instructor of Molecular Biology and Pharmacology. "We initially thought that this protein might be involved in blood vessel formation. What we discovered, though, is that it's a potent killer of bacteria."

Dr. Hooper is first author of the study. ASBMB member Jeffrey I. Gordon, M.D., the Dr. Robert J. Glaser Distinguished University Professor and Head of the Department of Molecular Biology and Pharmacology, led the study.

The team identified a protein called angiogenin 4 (Ang4), which belongs to a class of proteins originally believed to be involved in the development of blood vessels that supply tumors with nutrients. The group discovered that Ang4 was released by specific cells, called Paneth cells, located in the intestinal lining.

Because Paneth cells are known to assist the immune system in defending against infection, the team examined Ang4 to determine how it interacts with a variety of different microbes. They found that the protein killed certain kinds of gut microbes and conclude that Ang4 may be part of an arsenal of microbicidal proteins deployed by Paneth cells to help keep gut bacteria from getting too close to the intestinal lining, where they could cause damage or mount an invasion.



Dr. Jeffrey Gordon

Moreover, the researchers were surprised to find production of Ang4 is controlled by a bacterium that makes its home in the intestine. The microbe, called Bacteroides thetaiotaomicron, is a prominent member of the mouse and human gut microbial community. This makes Ang4 unique, as it is the first example of a protein antibiotic whose expression is controlled by friendly intestinal bacteria.

"Robert Frost said it best: 'Good fences make good neighbors,'" noted Dr. Hooper. "Apparently, one of the functions of normal gut bacteria is to help erect an "electric fence" that protects the internal milieu from microbes we encounter throughout our lives."

The group also discovered that other mouse and human angiogenins, which are produced in other organs, also are able to combat dangerous microorganisms.

"These findings support the notion that the angiogenin family of proteins may represent a critical component of the body's innate defense system," Dr. Gordon says.

Designer Molecules May Correct RNA Splicing Defects

With a high-tech fix for faulty cellular editing, scientists at Cold Spring Harbor Laboratory have moved a step closer to developing treatments for a host of diseases as diverse as breast cancer, muscular dystrophy, and cystic fibrosis.

Many human diseases have been linked to defects in a cellular editing process called pre-messenger RNA splicing. Adrian Krainer, an ASBMB member and molecular biologist at Cold Spring Harbor Laboratory, has spent years investigating this complex editing process, which takes the information coded in genes and makes it available for building proteins. In a new study, Dr. Krainer's team has devised a clever way to correct RNA splicing defects implicated in breast cancer and spinal muscular atrophy (a neurodegenerative disease). In principle, the technique could provide the ability to correct RNA splicing defects associated with any gene or disease.

For now, Dr. Krainer's method has been shown to work under the simplest of conditions — in test tubes with small segments of RNA. The next step is to adapt the technique for use in living cells. "It's a very promising approach," according to molecular biologist Brenton Graveley, of the University of Connecticut Health Center. "There are a lot of hurdles to be overcome in terms of delivering the corrective molecules to the cells that need to be treated. But theoretically the exact same approach could be taken for any gene at all, and the list of genes that have defects at the level of RNA splicing is very long," said Dr. Graveley, who is familiar with the research but not involved in the study.

For cells to produce protein, DNA is first transcribed into pre-messenger RNA. Pre-messenger RNA is a "word-for-word" representation of a DNA sequence in the language of RNA, but for reasons that remain unclear, pre-messenger RNA molecules contain excess "words" that are removed by splicing to create mature messenger RNA (mRNA), the templates that cells use to make proteins. In many genetic diseases, gene mutations cause errors in the RNA splicing process. Improperly spliced mRNA molecules lead to the creation of altered proteins that cannot perform their duties properly, resulting in disease.

Gene mutations that alter pre-mRNA splicing frequently cause an important segment of the RNA to be skipped or left out of the mature mRNA. With this in mind, Dr. Krainer and colleague Dr. Luca Cartegni looked for ways to tell a cell to include a piece of RNA that is erroneously skipped. They took inspiration from natural proteins that guide which segments are included when the cell's splicing machinery cuts up pre-mRNA and pastes only the important bits back together. One end of these guide proteins attaches to the pre-mRNA transcript. The other end recruits enzymes that carry out the actual cutting and pasting.

Dr. Krainer and Dr. Cartegni attached the recruiting portion of the guide protein to a synthetic molecule that can be programmed to bind to any piece of RNA according to its sequence. The researchers designed a batch of these molecules corresponding to a mutant form of the BRCA1 gene implicated in breast cancer. The designer molecules successfully caused the splicing machinery to include an important piece of BRCA1 mRNA that is usually skipped. Thus, the designer molecules corrected the splicing error, making a normal messenger RNA from a defective pre-messenger RNA transcript.

Next, the scientists turned their new technology loose on a mutant form of the SMN2 gene which is associated with the neurodegenerative disease spinal muscular atrophy (SMA). People afflicted with SMA generally possess both a fully defective SMN1 gene and one or more copies of the closely related SMN2 gene which, due to skipping of a particular segment during RNA splicing, is capable of producing only small amounts of normal mRNA. The severity of SMA symptoms could be relieved if a patient's SMN2 gene could be coaxed into producing more normal mRNA by including the skipped RNA segment more often. Just as they corrected splicing defects of BRCA1 RNA, Dr. Krainer and Dr. Cartegni's designer molecules also enhanced the production of properly spliced SMN2 RNA.

The scientists dubbed the method ESSENCE (Exon-Specific Splicing Enhancement by small Chimeric Effectors). The next step is to create ESSENCE designer splicing molecules that pass easily into cells and can home in on the desired splicing targets. If such molecules can be developed, they may ultimately prove useful for treating a great diversity of human disease.

2001-2002 Graduation Survey Results

The 2001-2002 ASBMB Graduation Survey found a decrease in the number of bachelors and masters degrees awarded while doctorates awarded were up substantially from the 2000-2001 Graduation Survey. The survey was sent to a total of 448 departments known to offer degrees in biochemistry, molecular biology, or chemistry with a biochemistry emphasis, and 223 responded, up 16% from the 192 in the previous year.

The schools responding reported awarding 1,985 bachelors and 296 masters degrees, and 650 doctorates between July 1, 2001 and June 30, 2002. The corresponding numbers for 2000-2001 were 2,036 bachelors, 341 masters, and 450 doctorates. The decrease in bachelors and masters conferred and the increase in doctorates is possibly due to the type of institutions responding to the survey. Most of the institutions responding had a student population of less than 5,000, but this includes medical schools which often have small enrollments.

At both the bachelors and masters level, degrees awarded in 2001-2002 were down for all minorities, while at the Ph.D. level all categories were up from the preceding year. For 2001-2002 the number of minorities receiving bachelors was 459, down from 654 in 2000-2001; for masters it was 68, down from 96; but the 2001-2002 survey found 127 minority candidates receiving doctorates compared to 78 in the preceding year

These graduation surveys are only as representative as the responses from departments. To see if your school responded to the survey, see the list of respondents at in the survey section of education at http://www.asbmb.org/. The schools that we know offer degrees at some level can also be seen in the education section of the website.

If you know of any schools that offer a degree in biochemistry, molecular biology, or chemistry with a biochemistry emphasis, please contact Kelly Gull at kgull@asbmb.faseb.org. With your assistance we can contact more schools and have an even more definitive 2002-2003 survey.

Students Graduated, July 1, 2001–June 30, 2002

	Bachelors			Masters			Doctoral		
	M	F	**Total**	M	F	**Total**	M	F	**Total**
American Indian or Alaskan Native	5	5	**10**	0	2	**2**	0	0	**0**
Asian	111	148	**25**	19	25	**44**	45	33	**78**
Black, not of Hispanic origin	29	48	**77**	3	6	**9**	6	7	**13**
Hispanic	39	55	**94**	6	6	**12**	9	11	**20**
Pacific Islander	8	11	**19**	0	1	**1**	6	10	**16**
White, not of Hispanic Origin	732	683	**1415**	100	78	**178**	215	133	**348**
International Students	49	62	**111**	23	27	**50**	104	71	**175**
Total	973	1012	**1985**	151	145	**296**	385	265	**650**

Powerful Technologies Will Probe Innate Immunity

A comprehensive and detailed picture of innate immunity—the human body's first line of defense against disease—is the goal of scientists funded by a recently awarded five-year, $24-million grant from the National Institute of Allergy and Infectious Diseases (NIAID).

Researchers at The Scripps Research Institute (TSRI) in La Jolla, California, the Institute for Systems Biology (ISB) in Seattle, and Rockefeller University in New York are using techniques that straddle the divide between biology and information science to fathom the workings of innate immunity. Knowledge generated could help scientists develop treatments for septic shock, certain autoimmune disorders and diseases caused by potential agents of bioterrorism.

Daniel Rotrosen, M.D., Director of NIAID's Division of Allergy, Immunology and Transplantation, notes, "The collaborators at TSRI, ISB and Rockefeller University have complementary expertise that is most impressive."

"Our goal is to develop an encyclopedia of innate immune system activity," says ASBMB member Richard J. Ulevitch, Professor and Chair of TSRI's Immunology Department and the project's principal investigator.

Innate immunity is inborn and provides an all-purpose defense against invasion. Innate immune system cells, including certain skin cells called Langerhans cells, arrive soon after foreign elements are detected. Some system components, called macrophages, find and engulf microorganisms, while others release chemicals that kill the organism directly. Still other cells begin recruiting specialized immune cells to the region.

Dr. Ulevitch and his co-investigators face the daunting task of identifying the thousands of genetic changes, proteins generated and biochemical pathways triggered by encounters between innate immune system cells and infectious agents. Unlike the highly specific antibodies, which are produced in almost infinite variety and which match a particular disease organism like a key in a lock, cells of the innate immune system react generically to a wide range of substances, including molecules found in the cell walls of many kinds of bacteria.

Dr. Richard Ulevitch

An encyclopedic account of these complex and interwoven processes requires a systems biology approach, says Dr. Ulevitch. Dubbed "21st-century biology," this relatively new field of systems biology melds mathematics, computer modeling, and new techniques of gene and protein analysis in an effort to gain a wide-angle view of biological systems.

Systems biology assembles information about many genes, proteins and biochemical reactions at once without regard for function. These enormous amounts of data are then integrated and examined from multiple perspectives to learn how the system as a whole behaves.

Scientists at TSRI, ISB and Rockefeller University will focus on human innate immune system genes that are turned either off or on when a cell meets an infectious organism. Due to the high degree of similarity in the innate immune systems in all animals, the scientists can employ mice to quickly determine which gene groups deserve further exploration. Both the human and mouse genes, for example, encode proteins involved in inflammation, a generic first response to invasion by foreign organisms or to trauma. Uncontrolled inflammation can cause extensive cell damage and even death. Better understanding of proteins involved in the initiation and control of inflammation could help scientists find targets for new drugs that can precisely modify the inflammatory response.

NIAID also recently awarded two contracts to support research in a key area of systems biology?bioinformatics?the computational analysis and organization of biological data such as gene sequences and protein structure. The contract awardees, Research Triangle Institute in Research Triangle Park, North Carolina, and Northrop Grumman in Herndon, Virginia, will assess the bioinformatics needs of scientists working in such areas as transplant biology and autoimmune diseases. The contractors will also develop and test a prototype system that reliably and simply collects, stores and analyzes many forms of biological data generated by multiple laboratories.

Dubbed "21st-century biology," this relatively new field of systems biology melds mathematics, computer modeling, and new techniques of gene and protein analysis.

"The new grant, along with these new bioinformatics contracts, signals NIAID's interest in advancing bioinformatics resources to support both basic and clinical research on immune-mediated diseases," NIAID's Dr. Rotrosen said.

EMBO and Chinese Academy of Sciences Join Efforts in Life Sciences

The European Molecular Biology Organization (EMBO) and the Chinese Academy of Sciences (CAS) have signed an agreement to enhance collaboration with each other over the next two years. The first cooperative agreement with another scientific organization that EMBO has signed during its 40 years of existence, it is designed to support life science researchers from China and Europe through fellowships and joint meetings.

"The significance of this agreement is two-fold. First of all, it consolidates our working relationship with the Chinese scientific community and secondly, it shows that EMBO is actively building links with scientific organizations throughout the world," said Frank Gannon, EMBO Executive Director

Under the agreement, both EMBO and CAS, will encourage researchers from China and Europe to enter into or intensify scientific collaborations with each other in the field of life sciences. To ensure that such co-operation will be beneficial to the development of science in Europe and China, the two organizations will identify priority areas for mutual aid with a view to establishing at least one large research project.

"The Chinese Academy of Sciences, the highest organization of natural sciences in China and a major player in the Chinese scientific community is pleased to see the signing of this agreement. It will open new possibilities for Chinese-European co-operation. This holds especially true for young life scientists on both sides," said Chen Zhu, Vice President of the Chinese Academy of Sciences.

Last year EMBO added a medium-term fellowship scheme directed at scientists from emerging economies to its portfolio. As part of the new agreement, two such fellowships will be awarded to young Chinese scientists from CAS laboratories. This will allow Chinese life science researchers to visit European laboratories for six to nine month periods. In return, the Chinese Academy of Sciences has agreed to fund visits of young European researchers to Chinese laboratories for two weeks to six months.

by John D. Thompson, Editor

ASBMB Member to Receive Biotechnology Heritage Award

The Chemical Heritage Foundation (CHF) and the Biotechnology Industry Organization (BIO) will present the 2003 Biotechnology Heritage Award to ASBMB member Dr. William J. Rutter. A biotechnology pioneer, Dr. Rutter cofounded Chiron Corporation in 1981 and directed the Hormone Research Institute at the University of California, San Francisco (UCSF), for nearly a decade. The award will be presented at the BIO 2003 Annual Convention, June 22-25, at the Washington, D.C., Convention Center.

"Leader of a top research institute, cofounder of a pioneering biotechnology company, Bill Rutter is that rare combination of entrepreneurial spirit and high-level management skills so important to the rapid growth of biotechnology both as a discipline and as a global industry," said Arnold Thackray, President of CHF.

In 1969, Dr. Rutter joined the faculty of UCSF as Hertzstein Professor and served as Chairman of the Department of Biochemistry and Biophysics from 1969 to 1982. From August 1983 through April 1989, he was Director of the Hormone Research Institute at UCSF. He became a Professor Emeritus in 1991.

Biotech Pioneer William Rutter

The Biotechnology Heritage Award recognizes individuals who have made significant contributions to the development of biotechnology through discovery, innovation, and public understanding. Nobel Laureates Walter Gilbert and Phillip A. Sharp, both ASBMB members, were honored in 2002 for founding Biogen, a pioneer company in biotechnology. Francis S. Collins, Director of the National Human Genome Research Institute, and J. Craig Venter, former President of Celera Genomics, received the award in 2001 for their key roles in the sequencing of the human genome.

CHF, a not-for-profit organization, operates a historical research library; creates and circulates traveling exhibits; develops and disseminates educational materials; publishes books and Chemical Heritage newsmagazine; offers fellowships and travel grants; conducts oral histories with leading scientists and industrialists; and hosts awards, conferences, and public events. For more information, visit www.chemheritage.org.

Human Genome Sciences Opens European Office

Human Genome Sciences Inc. has opened a new European subsidiary in Düsseldorf, Germany.

The new subsidiary, Human Genome Sciences Europe GmbH, will be responsible for European clinical trials of the company's portfolio of new drugs in clinical and late-stage pre-clinical development, the Rockville, Maryland, company said in a statement.

Florian Bieber, former head of the cardiovascular, metabolic disorders and central nervous system therapeutic areas at Bayer AG, has joined the company as Vice President of Drug Development Europe, Human Genome Sciences said. He will work with David Stump, Senior Vice President Drug Development, to manage the group's clinical trials and clinical research collaborations in Europe.

Taiwan Stem Cell Banks Embrace U.S. Technology

Rancho Cordova, California-based ThermoGenesis Corp. recently received its fourth BioArchive order from Taiwan. The system was ordered by the company's distributor, Cosmo Medical, for Taiwan Advance Biopharmaceutical, which now joins Healthbanks and the Tzu-Chi Foundation Cord Blood Bank as the third cord blood stem cell bank in Taiwan using the BioArchive System for their cord blood program. Four more such blood banks in mainland China have also acquired these systems for the production of therapeutic units of cord blood stem cells for the treatment of leukemias, lymphomas, diverse inherited anemias, such as sickle cell anemia and thalassemia, and other genetic diseases.

Kevin Simpson, ThermoGenesis President and COO, noted that in mainland China a new stem cell project was planning to inventory of one million samples, and predicted continued demand for BioArchive in Asia, which he said have been under-served by traditional U.S. and European bone marrow registries. "Cord blood," he stated, "serves as a readily available source of stem cells for bone marrow rescue treatment, especially for diseases such as thalassemia, which occurs at an incredibly high rate in Asia."

Avant to Develop Oral Anthrax and Plague Vaccine for Defense Department

The Defense Department has awarded Avant Immunotherapeutics, Inc. a subcontract to develop an oral combination vaccine against anthrax and plague using Avant's proprietary vaccine technologies. Under the agreement, Avant may receive over $8 million in a two-year period, covering vaccine development through preclinical testing. Avant executed the subcontract with DynPort Vaccine Company LLC, the prime contractor for the Defense Department's Joint Vaccine Acquisition Program headquartered in Fort Detrick, Maryland.

"This contract represents one of the first awards from a major U.S. Department of Defense (DoD) initiative to apply modern biotechnological innovations to the development of vaccines that can offer rapid, effective protection from multiple biological agents," said Una S. Ryan, Avant's President and CEO. "Current vaccines against bacterial bioweapons like anthrax and plague require a protracted dosing regimen or only limited protection, and each protects against only a single agent. The Defense Department is looking for new, improved generation vaccines that are effective, single-dose, and can protect against multiple agents.

Takeda Chemical and Beth Israel Deaconess Sign Research Agreement

Takeda Chemical Industries, LTD, and Beth Israel Deaconess Medical Center (BIDMC) have signed a research agreement to investigate the molecular basis of diabetes and obesity and to develop new therapies for these metabolic diseases. The $13.7 million three-year agreement calls for collaboration between Takeda and a team of scientists led by BIDMC Chief Academic Officer Jeffrey S. Flier. Principal investigators include BIDMC Chief of Endocrinology Barbara Kahn, an ASBMB member; Dr. Bradford Lowell, Dr. Joel Elmquist, and BIDMC Chief of the Division of Signal Transduction Lewis Cantley, also an ASBMB member.

Takeda Chemical Industries, an industry leader in the development of diabetes therapies, is Japan's largest pharmaceutical firm and one of the 15 largest pharmaceutical companies worldwide. More than 1,000 researchers at Takeda carry out world-class research using advanced technology in such fields as human genetics, receptors, and enzymes.

Under the terms of the three-year agreement, Takeda Chemical Industries will have an exclusive option to negotiate a license to new intellectual property derived from the collaboration. BIDMC and Takeda researchers will collaborate on a number of specific projects designed to elucidate the biological mechanisms of diabetes and obesity, with the overall goal of discovering novel proteins and new drug targets implicated in these life-threatening diseases.

As part of the collaboration, BIDMC will gain access to Takeda's expertise in medicinal chemistry and drug discovery as well as resources to develop important core facilities at BIDMC including animal metabolic physiology, mass spectrometry, and proteomics.

Public R&D Funding Pays Off in Germany

Businesses receiving support from the German Ministry of Education and Research invest more than one euro in research and development for every euro they receive from the ministry. This was the finding of a study, *Public Support for Research and Iinnovation Activities of Businesses in Germany,* conducted by the Centre for European Economic Research for the Ministry of Education and Research. One in six industrial companies receives public funding for research and innovation in Germany and a third of these participate in national research programmes.

The study of businesses which had received funding for basic research and high risk projects. found that those receiving government funds own more patents and are significantly more successful in getting their products onto the market. It also determined that more funding now targets collaborative projects than previously. While such projects were the exception 20 years ago, two thirds of funding now goes to collaborative projects, almost half of them public-private partnerships.

Concept Search:
Cutting Large Keyword Searches down to Size

Searching for an article that is about several topics in combination is one of the hardest things to do in most keyword-search systems. And when you search on a keyword and find that it describes astronomical features as well as biological ones (e.g., "mercury") you would like to be able to select only the portion of your result that has to do with your topic. It just got easier to do these things with the HighWire Portal's new concept search feature, called Topic Search.

How Concept Search Works: Start with a Keyword as a "Seed"

Searching for topics can be hit or miss in some systems. After all, how do you know what concepts or topics to search for? In the HighWire Portal you start a topic search with a keyword search that will find *some* of the articles you'd like: whenever you do a keyword search, your search results show you what topics the resulting articles are indexed under. You can then easily use the topics shown, individually or in combination, in a topic search with just a few clicks. You can subset your keyword search to retain only articles about certain concepts, or you can start a new search based entirely on combinations of concepts in an article.

Example: Concept Search at Work

Suppose you are interested in ubiquitin-mediated degradation by the proteasome. You begin a concept search by planting a seed: you could do a keyword search for articles that have *all* the words "ubiquitin-mediated degradation by the proteasome"; zero result is not surprising. But a keyword search for *any* of those words finds almost 5 million items! The top items in the result – thanks to "relevance ranking" —are good ones to use as seeds in a concept search, though. But, perhaps best, a simple keyword search on the word "proteasome" retrieves "only" about 12,000 items. Let's start with this last result as the seed for searching by concept.

Figure 1

Notice the blue, right-most column of the search result page shown here – you can narrow or widen your browser window depending on whether you want to see the topics or not. Here we see a selection of the topics that each article is filed under. We're going to check the boxes for the topics that match the concepts we're interested in: Ubiquitin, Protein Degradation, and Proteasomes.

Then click on the Search button toward the top of this right most column. First choose options for ALL topics (meaning that each article in the new result must contain all three checked topics) and Within Current Result (meaning that our keyword search result on "proteasome" will be reduced, refined and limited to the three topics we've chosen.

The new result is "only" 233 articles, but each of these articles has something to say about all of these three topics.

Notice that the first article is a review article covering these topics. With the "one click" options described in an earlier article in this series, you can quickly limit the result to review articles only, or to the top-ranked HighWire-hosted articles (for which full text is likely to be online), or sort the results so that the newest articles are first. You can even further narrow your topic search by checkmarking more topics and clicking the Search button again.

The Limitations of Concept Searching

Concept search is a good way to "find what you are missing" when you have been relying on the more traditional author and keyword searches. It is good to pair it alongside other exploration tools like Citation Map and Instant Index (both described in previous articles in this series), and MatchMaker (described in an upcoming article).

You should not use concept search as your *only* tool when you need to conduct an exhaustive review of a topic. While the "taxonomy" of concepts is extensive?we have indexed almost 30,000 concepts?and was developed and tested by working scientists and editors using a real-world scientific and medical vocabulary, the actual assignment of individual articles to specific topics is done by computer programs. (The programs analyze text in articles and extract concepts by looking for frequent phrases that match the phrases that editors have said are associated with the topics.) The computer assignment is generally very reliable, but not perfect: a few topic assignments are made that shouldn't be, and a few are not made that should be. We're sure you'll spot some of each!

Check Our New Website

ASBMB's website now has a new, more up-to-date look. and greatly improved navigation. We added a "What's New" section to our home page, so you can get to the latest Society news in one click of the mouse. The home page also contains graphic links to all of our publications. Once you are past the home page, you will realize that we have made navigating the site a lot easier. On each of page you will find two menu bars right under our logo. The first one allows you to move back and forth between the main areas, a second menu bar below the first one shows the submenu for the selected area. This way, you always know where you are and can quickly get to the information you need.

From our site you can renew your membership or, if you are not already a member, join the Society. You can also register for ASBMB-sponsored meetings and read our magazine, *ASBMB Today,* or download a PDF of it.

Our goal is to make the site a valuable resource. Giving the content managers the ability to keep the site up to date makes the information more accurate and relevant. We see the site as a dynamic resource for communicating with the membership, and this update bring us closer to that goal. *(Information by System Coordinator Hector Martinez.)*

Education in the Molecular Life Sciences: The Central Role of Biochemistry and Molecular Biology Satellite Meeting

July 18-20, 2003*
University of Toronto, Canada

Organized by: J. Ellis Bell, University of Richmond and Jeanne Narum, PKAL

Sponsored by the ASBMB, IUBMB and Project Kaleidoscope

New Teaching Pedagogies
Computational Approaches for Use in Education of Biochemists and Molecular Biologists
Teaching Biotechnology Around the World
Designing Curricula that Work for Students: Undergraduate, Ph.D and M.D.
The Central Role of Quantitative Skills in Biochemistry and Molecular Biology
Plans for Assessing the Impact of Innovation in Education

*To be held immediately prior to International Congress of Biochemistry and Molecular Biology, July 20-24, 2003, Toronto IUBMB Congress website: http://www.iubmb2003.org

For further information contact:
Dr. Ellis Bell: jbell2@richmond.edu or the
ASBMB, 9650 Rockville Pike, Bethesda, MD 20814
Tel: 301-634-7145; Fax: 301-634-7126; Email: kgull@asbmb.faseb.org
Meeting website: http://www.richmond.edu/~jbell2/iubmb-satellite.html

Calendar of Scientific Meetings

APRIL 2003

Origin and Evolution of Mitochondria and Chloroplasts Advanced Lecture Course for the Federation of European Biochemical Societies (FEBS)

April 5–10 • Hvar, Croatia
Contact: Prof. Dr. Jürgen Soll
Ph: + 49 89 17861 225/273/276; Fx: + 49 89 17861 185
e-mail: hvar2003@botanik.biologie.uni-muenchen.de
Website: http://www.febs.unibe.ch/Activities/Advanced_Courses/Adoc03.htm

9th International Congress on Neuronal Ceroid Lipofuscinosis (Batten Disease)

April 9-13 • The Holiday Inn-City Centre, Chicago
Program Chair: Glyn Dawson, University of Chicago Pritzker School of Medicine; Website: http://www.ncl2003.org/

American Society for Biochemistry and Molecular Biology Annual Meeting in Conjunction with EB2003

April 11-15 • San Diego, California
Contact: EB2003 Office; Ph: 301-634-7010
Fx: 301-634-7014; Email: eb@faseb.org
Website: http://www.faseb.org/meetings/eb2003

9th National Symposium on Basic Aspects of Vaccines

April 30–May 2 • Bethesda, Maryland
Contact: Conference Secretariat; Walter Reed Army Institute of Research; Dept of Membrane Biochemistry
503 Robert Grant Ave, Room 2A24; Silver Spring, MD 20910
Ph: 301-319-9462 fx: 301-319-9035
e-mail: symposium@na.amedd.army.mil
Website: http://wrair-www.army.mil/symposia/dmbsym.htm

MAY 2003

Proteomic Solutions in Cellular and Developmental Biology and Medicine

May 2–4 • Stowers Institute, Kansas City, Missouri
Contact: Kelly Gull; Ph: 301-634-7145; Fx: 301-634-7126
Email: kgull@asbmb.faseb.org; Website: http://www.asbmb.org

10th Undergraduate Microbiology Education Conference

May 16-18 • University of Maryland, College Park, Maryland
Contact: Carlos Pelham; Ph: 202-942-9317
Email: EducationResources@asmusa.org
Website: http://www.asmusa.org/edusrc/edu4c.htm

JUNE 2003

Transposition, Recombination and Applications to Plant Genomics A Plant Sciences Institute Symposium

June 5-8 • Iowa State University, Ames, Iowa
Contact: Gulshan Singh
Ph: 515-294-7978; Fx: 515-294-2244; E-mail:pbmb@iastate.edu
Website: http://molebio.iastate.edu/-gfst/phomepg.html

ECM IV: Bone Tissue Engineering

June 30-July 2 • Davos, Switzerland
Contact: R. Geoff Richards, Dr. Sci. M.Sc. biol.
Programme Leader AO Research Institute,
Bioperformance of Materials & Devices
email: geoff.richards@ao-asif.ch; Ph: ++41 (0) 81 4142 397
http://www.aofoundation.org/events/ao/ecm/ECMIV/index.shtml

JULY 2003

FEBS 2003 Meeting on Signal Transduction

July 4-8 • Brussels
Contact: V. Wouters; Ph: 32 2 7795959; Fx: 32 2 7795960
Email: febs@iceo.be; Website: http://www.febs-signal.be

Education in the Molecular Life Sciences: The Central Role of Biochemistry and Molecular Biology

July 18-20 • University of Toronto, Canada
Contact: Kelly Gull; Ph: 301-634-7145; Fx: 301-634-7126
Email: kgull@asbmb.faseb.org
http://www.richmond.edu/~jbell2/iubmb-satellite.html

19th International Congress of Biochemistry and Molecular Biology

July 20-24 • Toronto, Canada
Contact: Congress Secretariat; Ph: 613-993-9431
Email: iubmb2003@nrc.ca
Website: http://www.nrc.ca/confserv/iubmb2003/

AUGUST 2003

First Gordon Research Conference on Cellular Osmoregulation: Sensors, Transducers and Regulators

August 15–20 • Roger Williams University, Bristol, RI
Contacts: Janet M. Wood (jwood@uoguelph.ca) and Karlheinz Altendorf (altendorf@biologie.Uni-Osnabrueck.de)
Website: http://www.grc.uri.edu/programs/2003/cellosmo.htm
Application: http://www.grc.org/scripts/dbml.exe?Template=/Application/apply1.dbm

Sixth International Symposium on Mass Spectrometry in the Health and Life Sciences: Molecular and Cellular Proteomics

August 24-28 • Fairmont Hotel, San Francisco
Contact: Marilyn Schwartz; Ph: 415-476-4893
Email: sfms@itsa.ucsf.edu
Website: http://donatello.ucsf.edu/symposium

Biology of Molecular Chaperones Mechanisms and Regulation of Chaperones

August 30–September 4 • Tomar, Portugal
Contacts: Dr. Josip Hendekovic or Caroline Walford
Ph: + 33 388 76 71 35; Fx: + 33 388 36 69 87
Website: http://www.esf.org/esf_euresco
Please quote 2003-15 in any correspondence

16th International Mass Spectrometry Society Conference

August 31–September 5 • Edinburgh, Scotland, United Kingdom
Contact: John Monaghan; Email: johnmonaghan@ed.ac.uk
Website: http://www.imsc-edinburgh2003.com

SEPTEMBER 2003

NMR in Molecular Biology
EuroConference on Structural Genomics: From Gene to Structure as viewed by NMR

September 5–10 • Obernai (near Strasbourg), France
Contact: Dr. Josip Hendekovic or Anne-Sophie Gablin
Ph: + 33 388 76 71 35; Fx: + 33 388 36 69 87
Website: http://www.esf.org/esf_euresco
Please quote 2003-14 in any correspondence

Sixth Conference on Protein Expression in Animal Cells

September 7–11 • Mont-Tremblant, QC, Canada
Contact: Marc Aucoin, Technical Officer
Biotechnology Research Institute; Email: 6thPEACe@nrc.ca
Website: http://www.bri.nrc.ca/6thPEACe

Third International Conference on the Pathobiology of Proteoglycans

September 20 - 25 • Parma, Italy
Contacts: Roberto Perris, Chair and Ariane De Agostini, Co-chair
Clinique de Stérilité de d'Endocrinologie gynécologique,
Hôpital Cantonal Universitaire de Genève
Ph: 41-22 / 382.43.46; Fx: 41-22 / 347.59.79
Email: Ariane.Deagostini@medecine.unige.ch
Website: http://www.assb.biol.unipr.it/PG2003

OCTOBER 2003

OARSI's 2003 World Congress on Osteoarthritis

October 12-15 • Palais am Funkturm, Berlin
Contact: OARSI Headquarters; Ph: 202-367-1177; Fx: 202-367-2177
Email: oarsi@oarsi.org; Website: www.oarsi.org

Cytokines, Signalling & Diseases

Oct. 26-30 • Cairns, Australia
Event Host: International Society for Interferon and Cytokine Research; Website: http://www.cytokines2003.conf.au/

JUNE 2004

American Society for Biochemistry and Molecular Biology Annual Meeting and 8th IUBMB Conference

June 12-16 • Boston, Massachusetts
Contact: Kelly Gull; Ph: 301-634-7145; Fx: 301-634-7126
Email: kgull@asbmb.faseb.org; Website:
http://www.asbmb.org/meetings

Renew Your 2003 Membership Online

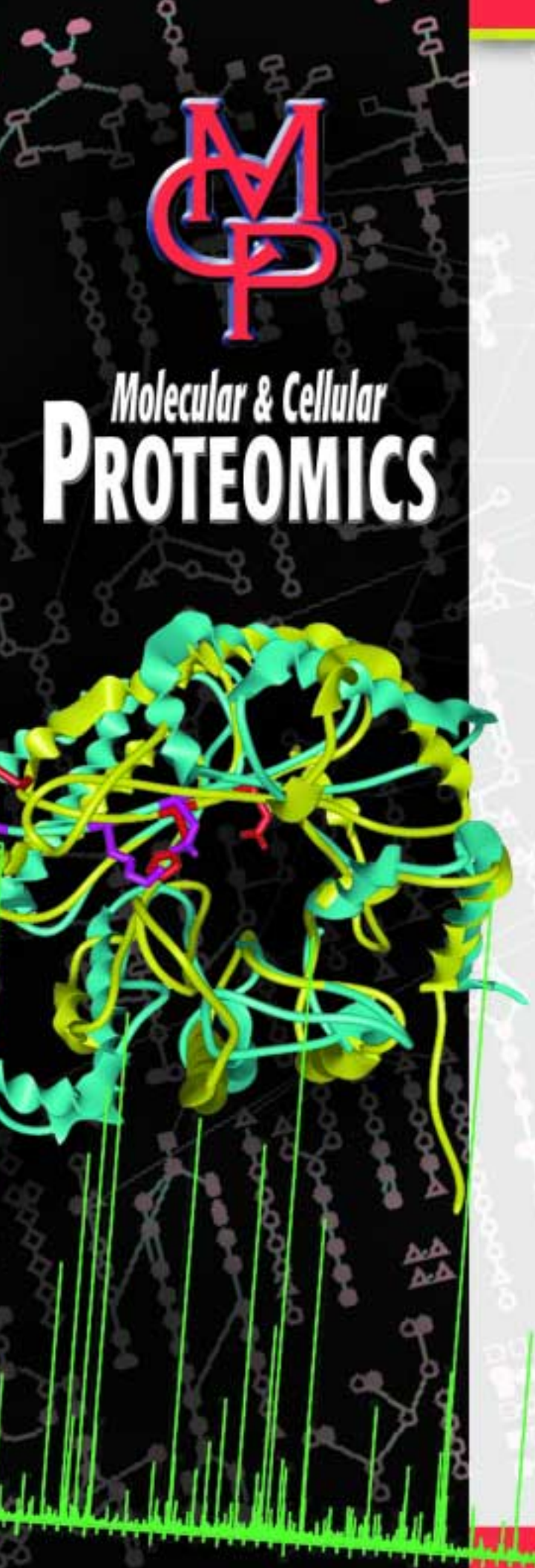
ASBMB dues notices have been mailed to all members and you can now make payment online at the ASBMB website: www.asbmb.org. Click on "Renew Now" in the "What's New" box.

New for 2003 — Membership Cards

The renewal notice includes your new ASBMB membership card. And don't forget, your membership includes a free subscription to our monthly magazine, *ASBMB Today,* plus free subscriptions to *JBC Online* and *MCP Online*. You also receive special member rates for *Biochemistry and Molecular Biology Education, The Journal of Lipid Research* and *Trends in Biochemical Sciences,* as well as the print versions of *JBC* and *MCP.*

ASBMB members may also register for the Annual Meeting at discounted rates. In addition, you can order your 2003 edition of the *Annual Review of Biochemistry* through ASBMB.

If you have any questions, please email asbmb@asbmb.faseb.org.



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