DEPARTMENT OF HEALTH AND HUMAN SERVICES

NATIONAL INSTITUTES OF HEALTH

Frontiers of Science

Witness appearing before the
Senate Subcommittee on Labor-HHS-Education Appropriations

Jeremy Berg, Ph.D., Director
National Institute of General Medical Sciences

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Richard J. Turman, Deputy Assistant Secretary, Budget

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National Institute of General Medical Sciences
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Mr. Chairman and Members of the Committee:

I am pleased to present the Fiscal Year 2008 Presidentôs budget request for the National Institute of General Medical Sciences (NIGMS). The Fiscal Year 2008 budget includes $1,941,462,000.

Throughout its 45-year existence, NIGMS has been a wellspring of discovery. The fundamental knowledge generated by NIGMS research impacts every other NIH component and has broad applications in the pharmaceutical and biotechnology industries. NIGMS contributes to the health of the biomedical research enterprise in other important ways, as well. A prime example is our cutting-edge research training program, which produces a substantial number of well-prepared new scientists. Their ideas and talents contribute to our growing knowledge base, allowing continued progress toward treatments and cures for countless diseases that rob us of friends, family, and years of productive life.

NURTURING INTELLECTUAL CAPITAL

When discussing science and medicine, we often focus on compelling research advances and medical breakthroughs. But behind every ñwhatò is a ñwho,ò a creative individual asking and answering a crucial questionð the brainpower driving scientific progress. NIGMS is steadfast in its commitment to nurturing and maintaining this intellectual capital through its significant support of investigator-initiated research and research training.

In the context of this opening statement, it has become habit to reference the past yearôs NIGMS-supported Nobel Prizes. Of course, this is a ritual I am extremely proud to continue by reporting that the 2006 prizes in the two areas most relevant to biomedicine, physiology or medicine and chemistry, went to three NIGMS grantees. But I would like to go further, using the prize-winning research to show you how NIGMS support creates opportunities for major discoveries to happen.

Two geneticists, Andrew Fire and Craig Mello, received the 2006 Nobel Prize in physiology or medicine for their discovery of a gene-controlling mechanism called RNA interference. Their breakthrough came about by surprise, when they had the keen insight to figure out why an experiment failed. Fire and Melloôs seminal finding, made relatively recently in 1998, has dramatically transformed biomedical research and has already led to new treatments that are being tested in the clinic for a range of diseases.

The 2006 Nobel Prize in chemistry is a very different story. In this case, the achievement resulted from painstaking persistence on a fundamentally important question. The prize went to a biochemist who refused to give up on a problem that even

today would be perceived as ferociously difficult. Combining biochemical research with novel biophysical methods, Roger Kornberg captured a detailed, three-dimensional snapshot of the enzyme that reads our genes. This work has deeply enriched our understanding of one of the most fundamental life processes: how DNA gets copied into RNA. While the mindset, creativity, and acumen were Kornbergôs, decades of unwavering NIGMS support enabled him and a talented set of coworkers to pursue this groundbreaking accomplishment, which has had a significant impact on biomedical research.

TOOLS BREED INNOVATION

To capitalize on creative ideas, scientists need tools as well as funding. These tools can take many forms, from new technologies to model organisms. Research with bacteria, yeast, insects, worms, and rodents continues to confirm that the basic operating principles are nearly the same in all living things, and that studies in other organisms yield important knowledge applicable to human health.

Thus, we are no longer surprised to learn that a gene or a process in a mouse, a worm, or a fruit fly is the same, or very similar, as that in a person. Examples of high-impact research done using model organisms abound, including the 2006 Nobel Prize-winning discoveries, which were made in roundworms and yeast. A more recent study in roundworms showed how early cell damage contributes to the development of Huntingtonôs disease. The researchers who did this work discovered that an error in how proteins fold leads to the massive protein clumping inside cells that typifies Huntingtonôs disease. Because protein clumping is also linked to other neurological conditions such as Alzheimerôs and Parkinsonôs diseases, it is likely that this work will have far-reaching implications.

Along with essential new knowledge about life processes, health, and disease, basic research can yield technologies with direct medical relevance. A case in point is an unexpected discovery by bacteriologist Yves Brun. While studying bacteria to better understand cell division, he found that the organisms produce a remarkable, natural form of ñsuperglue.ò Additional studies revealed that the bacterial glue is the strongest biological adhesive ever measured, capable of holding nearly 5 tons per square inch. Whatôs more, it doesnôt dissolve in water. Brun is now working to learn more about the properties of the natural glue, which could be an ideal candidate for a surgical adhesive.

For a further demonstration of uncharted exploration as a powerful engine of discovery, consider the study of the three-dimensional structures of biological molecules. This research, which relies heavily on tools and expertise from the physical sciences, has been a prime source for the development of life-saving medications like those used to treat AIDS, many types of cancer, asthma, and several other health conditions. NIGMS has provided significant support for structural studies and other research at the interface of the biological and physical sciences. In addition, we continue to communicate and collaborate with federal agencies focused on the physical sciences to maximize the benefit of our funding activities to the scientific community.

Of course, technology is only useful if it is available and affordable to many bright minds across the country. Every investment NIGMS makes has this end goal in mind, and currently the Institute is supporting several databases, materials repositories, genetic and genomic tools, and other shared resources that provide vital information and equipment to thousands of biomedical researchers. The Instituteôs team science efforts in such areas as high-throughput protein structure determination (the Protein Structure Initiative), how genes affect individual responses to medicines (the Pharmacogenetics Research Network), and new approaches to significant and complex biomedical problems via collaborations among scientists from diverse fields (ñglue grantsò), have all matured to a level where the fruits of progress are being shared widely with scientists everywhere.

INVESTING IN THE FUTURE

Perhaps the most important element in determining the future of biomedical research is providing young people with opportunities to develop an understanding of the scientific process and to become fascinated with the challenges and opportunities that scientific careers present. Who will make the discoveries that will drive research in the future? If we went back in time, could we have known that Fire, Mello, Kornberg, and many other unnamed scientists would have gone so far in advancing our understanding of key life processes?

Some individuals can hardly avoid catching the science bug. Roger Kornberg grew up in a household dominated by science: His father, Arthur (also a long-time NIGMS grantee), shared the Nobel Prize in physiology or medicine when Roger was 12 years old. Roger took advantage of the many opportunities available to him and began learning about science at a very early age.

Most people, however, do not grow up in such a rich scientific environment. Take Ryan Harrison, who caught the science bug a few years ago, while attending a Baltimore City public high school that has a large population of underrepresented minority students. Ryan, the son of a teacher and a former corrections officer, met Jeffrey Gray, a biophysicist at Johns Hopkins University, through an outreach program. Ryan spent 2 years working in Grayôs laboratory and then came in 5th place in the Intel Science Talent Search, the most prestigious high school science competition in the country. He continues to pursue research as an undergraduate at Johns Hopkins, and we look forward to following his progress and achievements.

In order to address the health needs of our nation, we must tap the full diversity of the talent pool of our country to attract the best minds into research. NIGMS has been a pioneer in this arena through its programs that provide opportunities for underrepresented minorities to pursue scientific careers. We recognize that underrepresentation is a challenging and complex problem. Single interventions are unlikely to effect lasting, multidimensional changes in diversity. As these programs mature, we are committed to conducting and rigorously evaluating the effectiveness of a broad range of biomedical workforce diversity programs.

Once scientists have embarked on their careers, we must continue to provide opportunities for them to contribute fully to biomedical research. An effort to do just that is the new NIH Pathway to Independence award, which facilitates the transition of highly promising postdoctoral scientists from mentored to independent research positions. NIGMS was delighted this year to receive, and fund, a healthy number of applications for this unique program. In addition, we continue to give special consideration to regular research grant applications from new investigators as another way to help them get a solid start.

We also realize the need for scientists to be able to test unconventional, potentially paradigm-shifting hypotheses and use novel, innovative approaches to solve difficult technical and conceptual problems that impede scientific progress. Toward this end, we are developing a new grant program based primarily on the innovativeness and potential impact of a scientistôs ideas. We will launch the program later this year and anticipate that it will serve as a model for other NIH institutes and centers. The design of this program has benefited from our experience with the NIH Directorôs Pioneer Award program, an intriguing experiment on how to fund scientific research that is part of the NIH Roadmap for Medical Research.

Through the efforts I have described today, we hope to continue our strong record of identifying and supporting the talented and creative scientists whose work paves the way for future medical advances.

Thank you, Mr. Chairman. I would be pleased to answer any questions that the Committee may have.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institute of General Medical Sciences
CURRICULUM VITAE

Name: Jeremy Mark Berg

Position: Director, NIGMS

Birthplace And Date: Stanford, California
April 10, 1958

EDUCATION:
B.S., Chemistry, Stanford University, 1980
M.S., Chemistry, Stanford University, 1980
Ph.D., Chemistry, Harvard University, 1985

EXPERIENCE:

Nov. 2003 – Present	Director, National Institute of General Medical Sciences, NIH
1990 – 2003	Professor and Director, Department of Biophysics and Biophysical Chemistry Director, Markey Center for Macromolecular Structure and Function, The Johns Hopkins University, Baltimore, MD
1992 – 2003	Professor of Chemistry, The John Hopkins University, Baltimore, MD
2001 – 2003	Director, Institute for Basic Biomedical Sciences, The Johns Hopkins University School of Medicine, Baltimore, MD Co-Director, Keck Center for Rational Design of Biologically Active Molecules, The Johns Hopkins University, Baltimore, MD
1986 – 1990	Assistant Professor, Department of Chemistry, The Johns Hopkins University, Baltimore, MD
1984 – 1986	Jane Coffin Childs Memorial Fund Postdoctoral Fellow, The John Hopkins University School of Medicine, Baltimore, MD
1980 – 1983	National Science Foundation Predoctoral Fellow, Harvard University, Cambridge, MA
1979 – 1979	Visiting Research Associate, Charles F. Kettering Research Laboratory, Yellow Springs, Ohio

Department of Health and Human Services
Office of Budget
Richard J. Turman

Mr. Turman is the Deputy Assistant Secretary for Budget, HHS. He joined federal service as a Presidential Management Intern in 1987 at the Office of Management and Budget, where he worked as a Budget Examiner and later as a Branch Chief. He has worked as a Legislative Assistant in the Senate, as the Director of Federal Relations for an association of research universities, and as the Associate Director for Budget of the National Institutes of Health. He received a Bachelorôs Degree from the University of California, Santa Cruz, and a Masters in Public Policy from the University of California, Berkeley.