

Testimony before the  
Senate Science and Space Subcommittee  
Senate, Commerce, Science and Transportation Committee  
by  
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## **Introduction**

Good afternoon, Madam Chairwoman and members of the Subcommittee. Thank you for this opportunity to testify before you today on the FY 2007 research and development (R&D) budget request for the National Science Foundation.

The American Association for the Advancement of Science (AAAS) is the world's largest general scientific society and publisher of the journal, *Science* ([www.sciencemag.org](http://www.sciencemag.org)). AAAS was founded in 1848, and includes some 262 affiliated societies and academies of science, representing 10 million individuals. *Science* has the largest paid circulation of any peer-reviewed general science journal in the world, with an estimated total readership of over one million. The non-profit AAAS ([www.aaas.org](http://www.aaas.org)) is open to all, and our members come from the entire range of science and technology disciplines. AAAS fulfills its mission to “advance science and serve society” through initiatives in science education; science policy; international programs; and an array of activities designed both to increase public understanding and engage the public more with science.

From our unique perspective, AAAS recognizes, as does the Administration in its budget proposal for NSF, the importance of a broad, balanced portfolio of R&D investments. The need for strong support across all scientific fields comes both from the increasing interdependence of physical, biological, behavioral, and social sciences, and from the importance of all these fields to innovation and to the improvement of the economy, health and quality of life of all Americans.

In fact, based on the scientific and, therefore societal, opportunities that will still go unmet, we believe even greater support would be justified than that proposed in the President's budget for the kind of cutting-edge, breakthrough research that universities and national

laboratories are uniquely qualified to conduct. As pointed out in the landmark report from the National Academy of Sciences, “Rising Above the Gathering Storm”, and the bipartisan Congressional Summit on Competitiveness, it is this kind of research and education in these fields that underpin future innovation, economic growth, and the health of all citizens in this science and technology dependent era.

This perspective is consistent with the President’s request to increase support for the National Science Foundation (NSF), because the Foundation plays such a special role in ensuring that America will continue to lead the world in scientific discovery and technological development. Given its singular ability to support broad-based transformational basic research, distinct from the many mission-oriented federal agencies and departments, we are delighted by the emphasis that the White House gives to the NSF in fiscal year 2007. We only regret that additional funds have not been proposed, since even with these increases, a large array of very exciting and important opportunities across the many fields of science will go unmet.

## **NSF and the ACI**

President Bush’s proposed FY 2007 budget recommends increases for key physical sciences research agencies as part of the “American Competitiveness Initiative” (ACI) that begins to respond to the growing wave of concern about the state of U.S. innovation. The ACI proposes to double funding for three agencies over the next decade, and the 2007 budget requests the first installment of this ambitious plan. The National Science Foundation (NSF) is one of the three favored agencies (the others are the DOE Office of Science, and the National Institute of Standards and Technology laboratories), and would receive a significant increase in the 2007 budget that would begin to turn around the decreases that came with the past two years of declining funding.

As part of the ACI, NSF would receive a 7.9 percent increase for a total budget of \$6.0 billion in FY 2007. The R&D portion of NSF’s budget would total \$4.5 billion, a gain of \$348 million or 8.3 percent. This would bring the R&D total slightly above 2004 levels in inflation-adjusted terms after cuts in 2005 and 2006. It is important to note that the proposed increases go not only to NSF’s investment in the physical sciences but across the entire NSF research portfolio, which spans the range of science and engineering disciplines. This translates into increases between 5 and 9 percent for most research directorates after several years of flat or

declining funding. Unfortunately, when viewed in constant dollars the President's proposed budget would still not restore NSF to pre-2004 levels (see Chart 1).

Research and Related Activities (R&RA) would receive \$4.7 billion, an increase of \$334 million or 7.7 percent above the FY 2006 level. The research directorates and offices would receive the following:

- Biological Sciences (BIO): \$608 million (up \$31 million or 5.4 percent).
- Computer and Information Science and Engineering (CISE): \$527 million (up \$30 million, or 6.1 percent).
- Engineering (ENG): \$629 million (up \$48 million, or 8.2 percent).
- Geosciences (GEO): \$745 million (up \$42 million, or 6.0 percent).
- Mathematical and Physical Science (MPS): \$1.15 billion (up \$65 million, or 6.0 percent).
- Social, Behavioral and Economic Sciences (SBE): \$214 million (up \$14 million, or 6.9 percent).
- Office of Polar Programs (OPP): \$438 million (up \$49 million, or 12.5 percent).
- Office of Cyberinfrastructure (OCI): \$182 million (up \$55 million, or 43.5 percent).
- Office of International Science and Engineering (OISE): \$41 million (up \$6 million, or 17.6 percent).
- Integrative Activities: \$131 million (down \$6 million, or 4.2 percent).

### **NSF and Math and Science Education**

We are concerned that the NSF's Education and Human Resources (EHR) budget, in contrast to the research budget, would increase just 2.5 percent to \$816 million in 2007. This means that it would remain 20 percent below the 2004 funding level in real terms. Small increases in graduate education and human resource development programs would be offset by cuts to undergraduate education programs, and research on how students learn would be flat funded.

In addition, the budget request for the Math and Science Partnership (MSP) would decline, marking the third straight year that this program has been unable to provide any new awards. Despite expressions of national concern that we must enhance science and math

education, the MSP program request for FY 2007 is merely \$46 million, a reduction of \$17 million from last year.

As the National Academies recognized in “Rising above the Gathering Storm,” improving math and science education is crucial to guaranteeing the United States’ future economic competitiveness, and therefore I believe math, science and engineering education merit greater support than has been provided in the President’s budget.

AAAS’s Project 2061 has found that, too often, science students simply memorize vocabulary words and facts instead of gaining a deep understanding of the concepts and processes of science. NSF, as an organization of scientists, is best suited to develop techniques to improve the teaching how science really works. NSF, and EHR in particular, has a demonstrated record of excellence, and it is important that the agency receive the funding it needs to take advantage of this expertise. NSF’s connections with working scientists ensure that students can be exposed to science in a manner that goes beyond memorizing textbooks and parroting responses of standardized testing.

In addition, investing in the activities of the EHR directorate will allow our students to benefit from NSF’s merit review system. There also are lessons that are learned uniquely from competitively awarded grants that link research with evaluation, and thus, inform us of what works and what does not in education.

## **NSF Trends**

NSF is the third-largest federal sponsor of physical sciences research, after DOE and NASA, and is among the top 3 federal funding agencies for nearly every science and engineering discipline. It is also the second largest funding source for R&D at colleges and universities behind only the NIH and provides the majority of federal support for basic research at colleges and universities in the social sciences, environmental sciences, non-medical biology, mathematics, and computer sciences. For the physical sciences and engineering, NSF funds more than 40 percent of all federally supported academic basic research.

As I have mentioned previously, the increases for NSF would go to support programs throughout the agency’s portfolio. In the attached chart (see Chart 2) you can see that between 2000 and 2007 the majority of the NSF directorates have followed more or less parallel paths as the agency’s budget authority has increased or decreased.

Unfortunately, even with the proposed 2007 budget increases, the agency would still fund fewer than 25 percent of the proposals it receives as. This is significant because according to a report issued by the National Science Board (of which I am a member), in “FY 2005, close to \$1.8 billion of declined proposals were rated as high as the average rating for an NSF award (4.1 on a 5-point scale). These declined proposals represent a rich portfolio of unfunded research and education opportunities.”

## **Conclusion**

We at AAAS applaud the increases proposed by the Administration for the National Science Foundation, particularly during this time of tight budget constraints. However, we also want to emphasize that this is only a beginning in redressing some of the real-dollar declines in NSF’s budget of recent years. A great amount of very important work will still go unfunded and greater contributions to society could be reaped with even greater increases.

For example, in July 2005, the AAAS journal, *Science* celebrated 125 years of providing the scientific community with the latest in peer-reviewed research. In recognition of this important year, AAAS published a special issue on “125 Questions: What Don’t We Know?” Answering virtually every one of those questions depends on NSF supported research! Examples of *Science*’s 125 most important unanswered questions include:

- What are the limits of conventional computing?
- What are the limits of learning by machines?
- What is the most powerful laser researchers can build?
- What is the ultimate efficiency of photovoltaic cells?
- Will fusion always be the energy source of the future?
- Can researchers make a perfect optical lens?
- What causes ice ages?
- Are we alone in the universe?
- How does Earth’s interior work?
- Are there earthquake precursors that can lead to useful predictors?
- How much can the human life span be extended?
- What is the biological basis of consciousness?
- What controls organ regeneration?

How do organs and whole organisms know when to stop growing?

Why has poverty increased and life expectancy declined in sub-Saharan Africa?

Why do some countries grow and others stagnate?

Importantly, every NSF directorate—from the behavioral and social sciences through the life sciences, to math and physical sciences and engineering—plays a critical role in this important work. At a minimum we urge you to support the President’s request for NSF. If it is possible to find the money to provide an increase above the President’s request, it would be a sound investment in the future of our country and the quality of life of our citizens.

## APPENDIX

### American Association for the Advancement of Science (AAAS)

The American Association for the Advancement of Science (AAAS) is the world's largest general scientific society and publisher of the journal, *Science* ([www.sciencemag.org](http://www.sciencemag.org)). AAAS was founded in 1848, and includes some 262 affiliated societies and academies of science, representing 10 million individuals. *Science* has the largest paid circulation of any peer-reviewed general science journal in the world, with an estimated total readership of over one million. The non-profit AAAS ([www.aaas.org](http://www.aaas.org)) is open to all and fulfills its mission to "advance science and serve society" through initiatives in science education, science policy; international programs; and an array of activities designed both to increase public understanding and engage the public more with science.

Every year since 1976, AAAS has published an annual report analyzing research and development (R&D) in the proposed federal budget in order to make available to the scientific and engineering communities and to policymakers timely and objective information about the Administration's plans for the coming fiscal year. At the end of each congressional session, AAAS also publishes a report reviewing the impact of appropriations decisions on research and development. AAAS has also established a Web site for R&D data on which we now post regular updates on budget proposals, agency appropriations, and outyear projections for R&D, as well as numerous tables and charts. The address for the site is [www.aaas.org/spp/rd](http://www.aaas.org/spp/rd).

### Alan I. Leshner

Dr. Leshner has been Chief Executive Officer of the American Association for the Advancement of Science and Executive Publisher of the journal *Science* since December 2001. AAAS (triple A-S) was founded in 1848 and is the world's largest, multi-disciplinary scientific and engineering society.

Before coming to AAAS, Dr. Leshner was Director of the National Institute on Drug Abuse (NIDA) from 1994-2001. One of the scientific institutes of the U.S. National Institutes of Health, NIDA supports over 85% of the world's research on the health aspects of drug abuse and addiction.

Before becoming Director of NIDA, Dr. Leshner had been the Deputy Director and Acting Director of the National Institute of Mental Health. He went to NIMH from the National Science Foundation (NSF), where he held a variety of senior positions, focusing on basic research in the biological, behavioral and social sciences, science policy and science education.

Dr. Leshner went to NSF after 10 years at Bucknell University, where he was Professor of Psychology. He has also held long-term appointments at the Postgraduate Medical

School in Budapest, Hungary; at the Wisconsin Regional Primate Research Center; and as a Fulbright Scholar at the Weizmann Institute of Science in Israel. Dr. Leshner is the author of a major textbook on the relationship between hormones and behavior, and has published over 150 papers for both the scientific and lay communities on the biology of behavior, science and technology policy, science education, and public engagement with science.

Dr. Leshner received an undergraduate degree in psychology from Franklin and Marshall College, and M.S. and Ph.D. degrees in physiological psychology from Rutgers University. He also holds honorary Doctor of Science degrees from Franklin and Marshall College and the Pavlov Medical University in St. Petersburg, Russia. Dr. Leshner is an elected fellow of AAAS, the National Academy of Public Administration, the American Academy of Arts and Sciences, and many other professional societies. He is a member of the Institute of Medicine of the National Academies of Science. The U.S. President appointed Dr. Leshner to the National Science Board in 2004, and he represents AAAS on the U.S. Commission for UNESCO.