

Written Testimony Submitted for the Record
Committee on Commerce, Science and Transportation
Subcommittee on Science, Technology and Innovation

by
Alan I. Leshner, Ph.D.
Chief Executive Officer
American Association for the Advancement of Science
Executive Publisher, *Science*
March 11, 2008

Introduction

Mr. Chairman and members of the Subcommittee, thank you for the opportunity to submit written testimony on the President's Fiscal Year (FY) 2009 research and development (R&D) budget request.

The American Association for the Advancement of Science (AAAS) is the world's largest multidisciplinary scientific society and publisher of the journal, *Science*. AAAS was founded in 1848, and includes some 262 affiliated societies and academies of science, representing 10 million individuals.

For more than 30 years, the AAAS R&D Budget and Policy Program has strived to be a comprehensive, reliable, and impartial source of information on the federal investment in research and development. AAAS recently released its analysis of R&D in the FY 2009 budget request, and the numbers presented in this statement reflect that analysis.

Overview

AAAS believes strongly in 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 engineering, physical, biological, behavioral, and social sciences, and from the importance of all these fields to innovation and the growth of the economy, as well as to the improvement of the health and quality of life of all Americans.

The President's FY 2009 budget proposal would increase funding for three key physical science agencies as part of the American Competitiveness Initiative (ACI), and we are pleased by the continued emphasis on investing in basic physical science research. However, we are at

the same time concerned that funding would stay constant or even decrease in other agencies and disciplines, like the biological, behavioral and social sciences, which also are critically important to innovation, the economy and the quality of life of all Americans.

The overall federal investment across all fields of R&D would increase \$4.9 billion or 3.5 percent over FY 2008 levels to \$147.4 billion (see Table 1). However, this is driven primarily by increases in **development** funding for defense weapons and NASA spacecraft. Federal investment in **basic and applied research**, the vital feedstock for innovation in the U.S. economy, would in fact decline 0.3 percent to \$57.3 billion.

The proposed FY 2009 budget continues to provide increases for the three physical sciences agencies as part of the administration's ACI vision of doubling between 2006 and 2016 the budgets of the National Science Foundation (NSF), the Department of Energy (DOE) Office of Science, and the National Institute of Standards and Technology (NIST) laboratories. These three agencies lead the pack in R&D gains, followed closely by proposed gains for development programs in DOE, NASA and the Department of Defense.

The increases for those key agencies, however, are partly offset by flat funding for biomedical research and cuts to key environmental and agricultural R&D agencies. Looking at the funding pictures in longer-term perspective, in inflation-adjusted terms, total federal investment in basic and applied research would fall for the fifth year in a row for a decline of 9 percent between 2004 and 2009.

Agency Analyses

In this section, AAAS will highlight a few key points in the budget request for agencies under the subcommittee's jurisdiction:

National Science Foundation (NSF): Overall, AAAS is very pleased with the proposed increase for NSF's programs in FY 2009, a 13.6 percent increase that would bring the total budget to \$6.9 billion. NSF's R&D investments (excluding education, human resources, and overhead spending) would total \$5.2 billion, a 15.5 percent increase, and an all time high in real terms.

The 2009 NSF request clearly favors the physical sciences (see Figure 1), with requested increases approaching 20 percent for three key directorates: Mathematical and Physical Sciences

(MPS, up 20 percent), Engineering (ENG, up 19 percent), and Computer and Information Science and Engineering (CISE, up 20 percent). The Biological Sciences (BIO) directorate would increase 10 percent, Geosciences (GEO) 13 percent, and the Social, Behavioral and Economic Sciences (SBE) 9 percent. NSF's education and human resources (EHR) programs would gain 9 percent to \$790 million. Although the latter increases are still substantial, we hope that the differential between them and those for the physical sciences does not reflect a misunderstanding of the critical importance of biological, behavioral and social science and of science education to the nation's innovativeness and the future of America's children.

AAAS would like to emphasize that the NSF is unique among all the R&D agencies in that its purpose is to support fundamental research across *all* scientific fields - not only the physical sciences - illustrating the interdependence of physical, biological, behavioral, and social sciences. While it is certainly appropriate for the remaining mission-oriented agencies to focus their research portfolios in related fields, a successful, innovative future will draw upon contributions and interactions from a broad spectrum of fields of inquiry, and robust support is needed for all of them. NSF's critical role includes serving as a bridge that unites **all** these interdependent fields.

National Aeronautics and Space Administration (NASA): The FY 2009 budget proposes a 2.9 percent increase in the total NASA budget, growing \$497 million to \$17.6 billion. However, the entire increase and more would go to two human space programs. The Constellation Systems program to develop the next generation human spacecraft could receive \$3 billion, an increase of 23.3 percent, which includes \$1 billion each for the Crew Exploration Vehicle and the Crew Launch Vehicle. The International Space Station would receive \$2.1 billion, a 13.6 percent increase.

Over the last several years, NASA support of research (the "R" part of R&D) has declined dramatically as the costs of the Constellation Systems and the Space Station have escalated. The 2009 budget would continue this disturbing trend. The Science portfolio would fall 5.6 percent to \$4.4 billion, with especially steep cuts for the Astrophysics (down 13 percent) and Heliophysics (down 31 percent) portfolios because of the end of a number of large missions (e.g., Hubble Space Telescope). Planetary Science and Earth Science would receive boosts of 7

percent each, however, with a special emphasis on new earth science missions. Aeronautics research funding would continue to tumble with a 13 percent cut to \$447 million (see Figure 2).

The NASA R&D portfolio would increase 4.9 percent to \$12.8 billion (see Table 1), with the entire increase and more coming from Constellation Systems and the Space Station.

National Institute of Standards and Technology (NIST): We applaud the FY 2009 budget's continuing commitment to the intramural laboratory research programs at NIST, which provide crucial support for the physical sciences that underlie much of U.S. innovation. NIST intramural research would significantly increase 16 percent to \$447 million. Once again, however, the budget request would dramatically scale back funding for NIST's external programs. As in previous years, the budget proposes to eliminate the valuable Technology Innovation Program and provide only \$4 million for the Hollings Manufacturing Extension Partnership to close out the program.

National Oceanic and Atmospheric Administration (NOAA): NOAA's funding of oceanic and atmospheric research, including crucial research on climate change and fisheries, would increase 7.5 percent in FY 2009, but that is only after one takes out the congressionally-designated earmarks that would be included in the final FY 2008 budget. If one calculates the NOAA budget with the 2008 earmarks then its budget would fall slightly to \$576 million.

Impact of FY 2008 Budget

While there is much to be pleased about in the FY 2009 budget request, it is important to consider the FY09 request in light of the FY 2008 omnibus appropriations. The final omnibus bill was a disappointment to scientists optimistic about potential increases related to the ACI. Despite House and Senate votes that were at or above the President's FY08 budget request, the final omnibus allocated NSF \$364 million less than the request. This is having a negative impact on thousands of faculty researchers, graduate students, undergraduates and post-docs. NSF will award 1,000 fewer new research grants (15% below request) and 230 fewer graduate research fellowships (8% below request) this year.

Several major program solicitations will be delayed for at least a year, including new programs directly focused on the development of a competitive scientific workforce. Many core research programs will have to scale back planned activities and several planned centers will not be funded in 2008. Likewise, critical maintenance and planned equipment upgrades will suffer in numerous operations throughout NSF's portfolio.

NIST, another ACI agency under this committee's jurisdiction, was set to receive a significant boost of \$65 million for its labs in FY08 but that shrunk to \$6 million in the final omnibus.

Conclusion

The ACI and the America COMPETES Act have done much to recognize that the U.S. economy, now and in the future, will depend on our ability to innovate, and that maintaining the U.S. lead in innovation relies on a strong foundation of federal investment in research and education. We appreciate and share that recognition. In spite of that acknowledgment, however, actual federal research investments are shrinking as a share of the U.S. economy, just as other nations are increasing their investments. China and South Korea, for example, are boosting government research by 10 percent or more annually.

Robust research funding is necessary in order for the nation to craft solutions to pressing issues, ranging from a greater understanding of and technological options for combating global climate change, to safely using nanotechnology, to ensuring sustainable oceans and fisheries, to ensuring critical improvements to health and the quality of life of all Americans.

In an increasingly technology-based economy that relies on federally funded research as the seed corn for technology-based innovation, the federal government needs a sustained commitment to a robust, fully balanced research portfolio that recognizes the interdependence and critical role of all scientific disciplines to a future innovative society.

APPENDIX A

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). AAAS was founded in 1848, and includes 262 affiliated societies and academies of science, serving 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 one million. The non-profit AAAS (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.

ALAN I. LESHNER
Chief Executive Officer
American Association for the Advancement of Science
and
Executive Publisher, Science

Alan I. Leshner is Chief Executive Officer of the American Association for the Advancement of Science (AAAS) and Executive Publisher of its journal, *Science*. From 1994 to 2001, Dr. Leshner was Director of the U.S. National Institute on Drug Abuse at the National Institutes of Health (NIH), and from 1988 to 1994 he was Deputy Director and Acting Director of the National Institute of Mental Health. Prior to that, he spent nine years at the National Science Foundation, where he held a variety of senior positions, focusing on basic research in the biological, behavioral and social sciences, on science policy and on science education. Dr. Leshner began his career at Bucknell University, where he was Professor of Psychology. His research has focused on the biological bases of behavior, particularly the role of hormones in the control of behavior. Dr. Leshner is an elected member of the Institute of Medicine of the National Academy of Sciences, and an elected fellow of the AAAS, the American Academy of Arts and Sciences, and the National Academy of Public Administration. He has received numerous awards from both professional and lay groups for his national leadership in science, mental illness and mental health, substance abuse and addiction, and public engagement with science. He received an A.B. degree in Psychology from Franklin and Marshall College and M.S. and Ph.D. degrees in Physiological Psychology from Rutgers University. He also has been awarded five Honorary Doctor of Science degrees.

AAAS Analysis of R&D in the FY 2009 Budget

Table 1. R&D in the FY 2009 Budget by Agency
(budget authority in millions of dollars)

	FY 2007 Actual	FY 2008 Estimate	FY 2009 Budget	Change FY 08-09	
				Amount	Percent
Total R&D (Conduct and Facilities)					
Defense (military)	79,009	77,782	80,688	2,906	3.7%
<i>S&T (6.1-6.3 + medical)</i>	13,518	13,215	11,669	-1,546	-11.7%
<i>All Other DOD R&D</i>	65,490	64,567	69,019	4,452	6.9%
Health and Human Services	29,621	29,816	29,973	157	0.5%
<i>Nat'l Institutes of Health</i>	28,350	28,676	28,666	-10	0.0%
<i>All Other HHS R&D</i>	1,271	1,140	1,307	167	14.6%
NASA	11,582	12,188	12,780	592	4.9%
Energy	9,035	9,661	10,519	858	8.9%
<i>Atomic Energy Defense R&D</i>	3,649	3,718	3,825	107	2.9%
<i>Office of Science</i>	3,560	3,574	4,314	740	20.7%
<i>Energy R&D</i>	1,826	2,369	2,380	11	0.5%
Nat'l Science Foundation	4,440	4,479	5,175	696	15.5%
Agriculture	2,275	2,309	1,952	-357	-15.5%
Commerce	1,073	1,138	1,152	14	1.2%
NOAA	557	581	576	-5	-0.9%
NIST	487	521	546	25	4.7%
Interior	647	676	618	-59	-8.7%
<i>U.S. Geological Survey</i>	574	586	546	-41	-6.9%
Transportation	767	820	902	81	9.9%
Environ. Protection Agency	557	548	541	-7	-1.3%
Veterans Affairs	819	891	884	-7	-0.8%
Education	327	321	324	3	0.9%
Homeland Security	996	992	1,033	41	4.1%
All Other	786	819	821	2	0.2%
Total R&D	141,933	142,441	147,361	4,920	3.5%
Defense R&D	82,658	81,500	84,513	3,013	3.7%
Nondefense R&D	59,276	60,941	62,848	1,907	3.1%
Basic Research	28,168	28,682	29,656	974	3.4%
Applied Research	28,599	28,751	27,626	-1,125	-3.9%
Total Research	56,766	57,433	57,282	-151	-0.3%
Development	81,363	80,567	85,363	4,796	6.0%
R&D Facilities and Equipment	3,804	4,442	4,716	275	6.2%

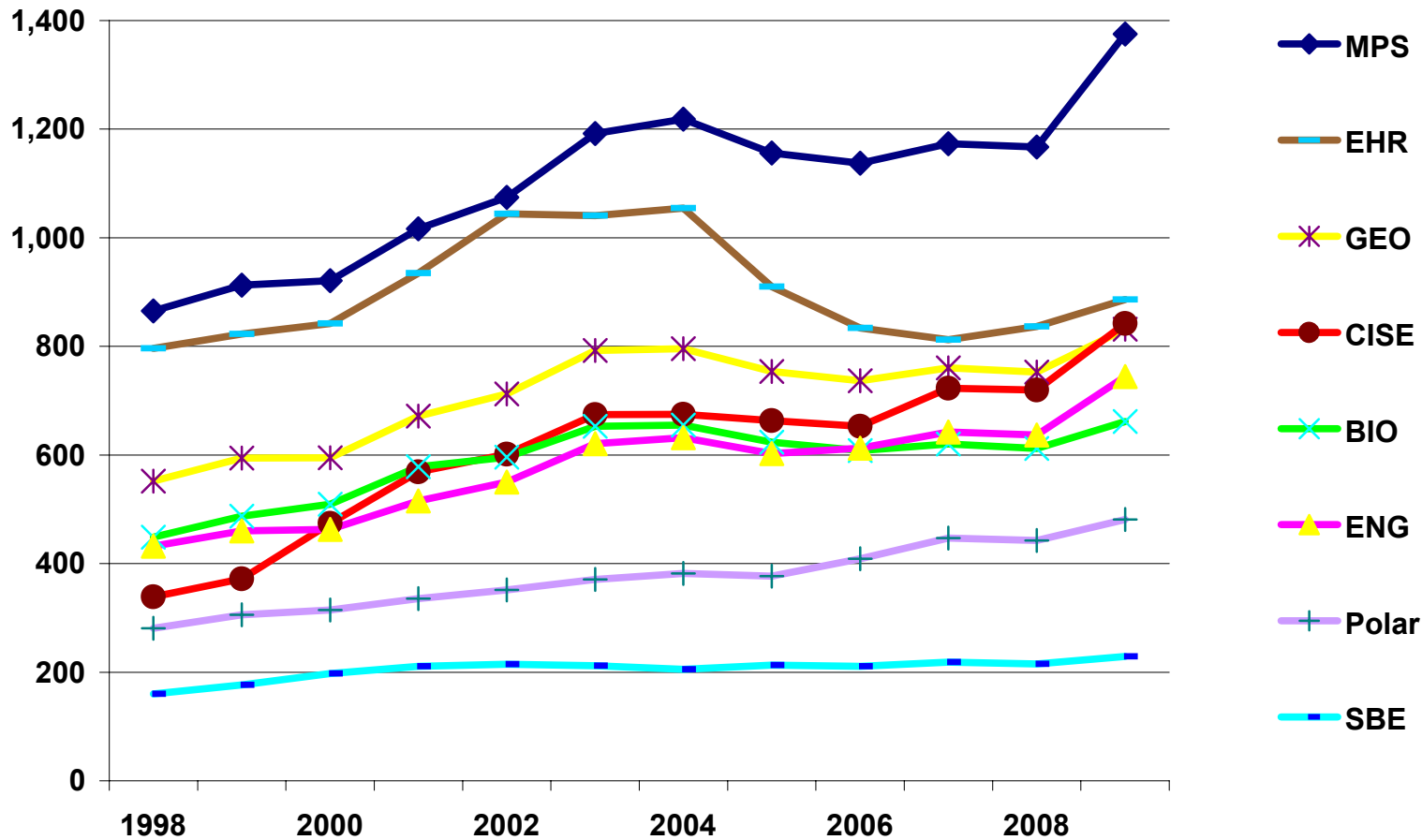
Source: AAAS, based on OMB data for R&D for FY 2009, agency budget justifications, and information from agency budget offices.

Note: The projected inflation rate between FY 2008 and FY 2009 is 2.0 percent. FY 2008 figures exclude pending supplementals.

March 7, 2008 - REVISED

NSF Budget by Directorate, FY 1998-2009

(budget authority in millions of constant FY 2008 dollars)

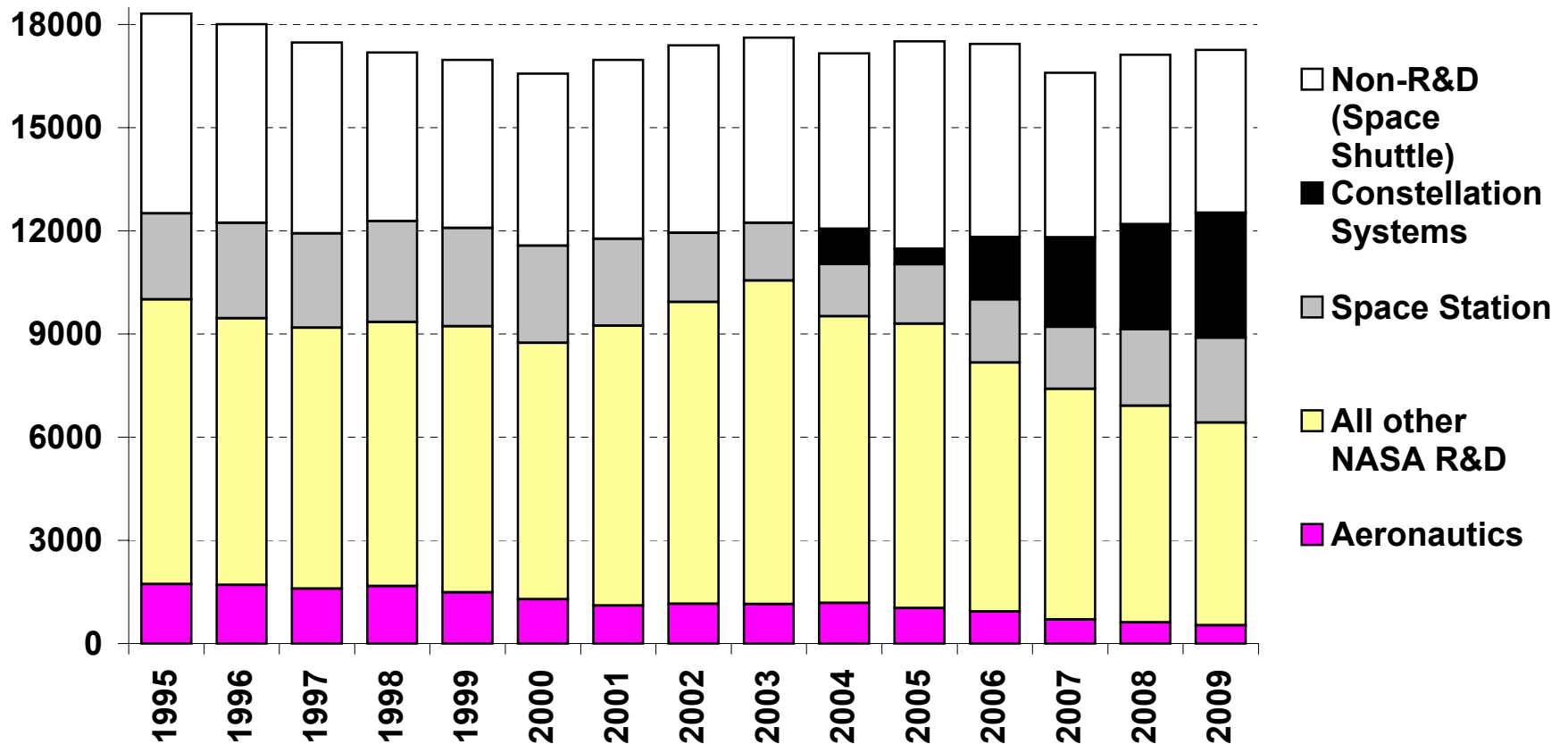


Source: National Science Foundation data. FY 2009 figures are President's request. CISE includes new Office of Cyberinfrastructure. R&D and non-R&D components included in directorate budgets. FEB. '08 © 2008 AAAS



Trends in NASA R&D, FY 1995-2009 *

in millions of constant FY 2008 dollars



Source: AAAS analyses of R&D in AAAS *Reports VIII-XXXIII*. * FY 2009 figures are latest AAAS estimates of FY 2009 request. Program budgets include associated support costs.

R&D includes conduct of R&D and R&D facilities.

MARCH '08 REVISED © 2008 AAAS

