

NSF Gains for the 2nd Year in 2008 Budget

AAAS R&D Funding Update on R&D in the FY 2008 NSF Budget

(This analysis is a preview of the NSF chapter in the forthcoming *AAAS Report XXXII: Research and Development FY 2008*, a comprehensive look at the President's budget for R&D in FY 2008. This analysis contains revised AAAS estimates of NSF R&D, different from figures originally presented in the President's budget. More tables and continually updated supplemental materials on R&D in the FY 2008 budget can be found on the AAAS R&D Web site at <http://www.aaas.org/spp/rd>.)

Highlights

- **The National Science Foundation (NSF) benefits from the second year of the Bush Administration's American Competitiveness Initiative (ACI) with an 8.7 percent boost in its total budget to \$6.4 billion in 2008, after a recently finalized similar boost in 2007 (see Table II-7).** Most research directorates would receive increases between 4 and 9 percent for the second year in a row.

- **NSF R&D investments (excluding education, training, and overhead costs) would total \$4.9 billion, an 8.3 percent increase to an all-time high in real terms.**

- All the research directorates would increase average award sizes, numbers of research grants, and success rates for research grant applications in 2008.

- NSF's Education and Human Resources (E.H.R.) budget would increase 7.5 percent to \$751 million in 2008 after remaining flat in 2007, but would remain 19 percent below the 2004 funding level in real terms.

NSF R&D in the FY 2008 Budget

Over a year ago, President Bush announced in his FY 2007 budget a proposal to substantially increase funding for key physical sciences research agencies over ten years as part of an "American Competitiveness Initiative" (ACI), designed in part to address a growing wave of concern about the state of U.S. innovation. The National Science Foundation (NSF) was one of three ACI agencies (the others are the DOE Office of Science, and the National Institute of Standards and Technology laboratories) favored with a requested increase of 8 percent for its budget, but because of congressional delays in wrapping up 2007 appropriations NSF only received its final 2007 budget last week on February 15, 4 ½ months into the fiscal year. NSF received most of what it asked for, the requested increases for its research programs but flat funding for its facilities construction and education and human resources programs.

The FY 2008 NSF budget, already released earlier this month, builds on the first year of the ACI with a second year of increases for most programs. **The total NSF budget of \$6.4 billion in 2008 would be \$513 million or 8.7 percent more than the final 2007 funding level.** (All figures in this analysis reflect final 2007 appropriations as signed into law on February 15.) The increases would go not only to NSF's investment in the physical sciences but across the entire NSF research portfolio, which spans the entire range of science and engineering disciplines. NSF is the third-largest federal sponsor of physical sciences research, after DOE and the National Aeronautics and Space Administration (NASA), but is among the top 3 federal funding agencies for nearly every science and engineering discipline. NSF is the second largest funding source for R&D at colleges and universities, behind only the National Institutes of Health (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. Thus, the broad-based increases in 2007 and 2008 would have a major impact on nearly all science and engineering disciplines, especially at universities.

After adjusting for inflation, the 2008 increase would enable NSF funding to narrowly reach an all-time high (see Figure 1). After peaking in 2004, NSF funding fell in 2005 and 2006 but would rise for the second year in a row in 2008.

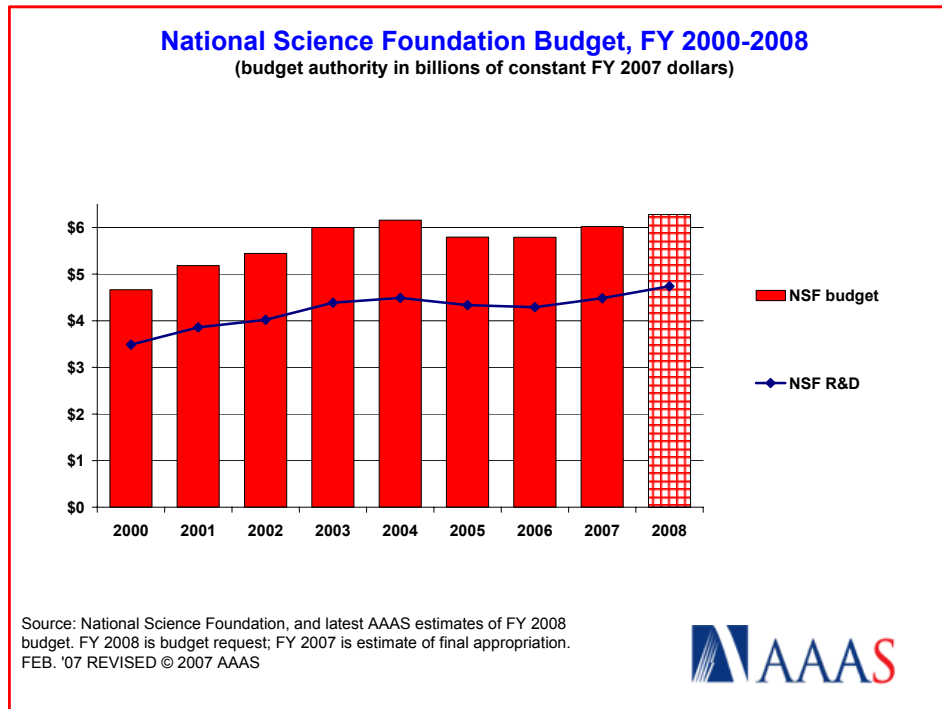


Figure 1. (click on the image for PDF)

NSF's R&D funding, which excludes NSF's education and training activities and overhead costs (such as polar logistics and administrative salaries), would total \$4.9 billion, a gain of \$374 million or 8.3 percent over the final 2007 appropriation that would bring the R&D total slightly above 2004 in inflation-adjusted terms (see Figure 1), after cuts in 2005 and 2006 and a rebound in 2007.

NSF's main **Research and Related Activities (R&RA)** account, which funds nearly all of NSF's basic and applied research and contains NSF's discipline-based research directorates, would climb 7.7 percent to \$5.1 billion (see Table II-7). Most research directorates would receive increases between 4 and 9 percent for the second year in a row after several years of flat or declining funding (see Figure 2). There would be larger increases for some key programs: the new Office of Cyberinfrastructure (OCI), a recent spin-off from the Computer and Information Science and Engineering (CISE) directorate, would see its funding climb 9.6 percent to \$200 million. OCI supports the procurement, development, and operation of state-of-the-art cyberinfrastructure resources for the entire research community. Its sister CISE directorate would gain 9.0 percent. OCI and CISE would take the lead in a new Cyber-enabled Discovery and Innovation (CDI) initiative to develop computationally based concepts and tools to deal with complex systems. The Mathematical and Physical Sciences (MPS) and Engineering (ENG), strong supporters along with CISE and OCI of the physical sciences broadly defined that are the ACI's focus, would gain 8.9 percent and 8.7 percent, respectively. Moving away from the physical sciences, the gains become smaller, dropping to 6.3 percent for the Geosciences (GEO) directorate (to \$792 million) down to modest increases for the Biological Sciences (BIO) directorate (up 4.1 percent) and Social, Behavioral, and Economic Sciences (SBE; up 3.9 percent).

Within R&RA, the Integrative Activities (IA) account would climb 14.6 percent to \$263 million, primarily from a \$24 million or 27.2 percent increase in Major Research Instrumentation (MRI), a program to distribute competitively awarded instrumentation grants to institutions for state-of-the-art research instrumentation that would be too costly to be funded through regular NSF research awards. The Experimental Program to Stimulate Competitive Research (EPSCoR) would move to IA and receive \$107 million, up \$7 million. EPSCoR assists research institutions and states that have traditionally been underrepresented in federal R&D funding to build research capacity. The program is currently open to 24 states, Puerto Rico, and the U.S. Virgin Islands; collectively, the EPSCoR states received just 10.4 percent of NSF R&D funds in FY 2004.

The Office of Polar Programs (OPP), which funds polar research but also provides logistical support for research activities at both poles and maintains the South Pole Station, would receive \$465 million, a boost of 6.1 percent. The OPP increase would build on a larger increase in 2007 to ramp up research during the International Polar Year (2007-2008) and for increased logistics costs to support that research. Away from the poles, NSF would invest a new \$17 million in oceans research in GEO to address important issues in ocean research identified recently by a multi-agency Ocean Research Priorities Plan.

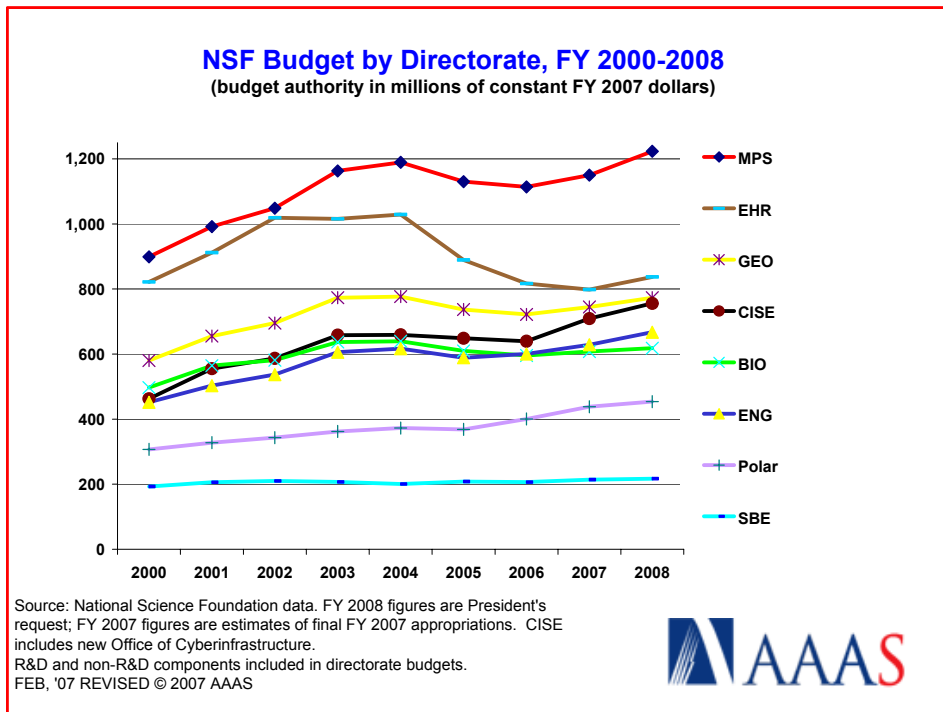


Figure 2. (click on the image for PDF)

Even after the substantial 2007 and 2008 increases, funding for several research directorates would remain below 2004 levels in real terms because of budget cuts in 2005 and 2006 (see Figure 2). In real terms, funding for the Geosciences (GEO) and Biological Sciences (BIO) would remain below 2004 levels, while the computer sciences, social sciences, mathematics and physical sciences, polar, and engineering directorates would reach new highs, though just narrowly.

The Major Research Equipment and Facilities Construction (MREFC) account would receive a \$54 million boost to \$245 million in 2008 to fund 7 projects (see Table II-7). A similar proposed boost in 2007 became flat funding in the final 2007 appropriation. MREFC funds only the construction of large scientific facilities; smaller facilities projects, planning and design for future facilities, research instrumentation grants, and facilities operations are funded in R&RA by the research directorates. Although final plans for 2007 have not been announced, NSF will try to initiate three projects in 2007 (the Ocean Observatories Initiative, the National Ecological Observatory Network, and the Alaska Region Research Vessel) if

sufficient funds are available. In 2008, NSF would start the Advanced Laser Interferometer Gravitational Wave Observatory (AdvLIGO), an upgrade to the existing LIGO in Washington and West Virginia of the world's most sophisticated optical interferometers, with a \$33 million allocation.

NSF education and human resources programs would increase \$52 million or 7.5 percent to \$751 million, but would remain 19 percent below 2004 levels in real terms after steep cuts in 2005 and 2006 and flat funding in 2007 (see Figure 2). In a reversal of past budgets, NSF would sustain the Math and Science Partnerships (MSP) program as a joint Department of Education (ED)-NSF program after seeking to transition the program to an Education-only one in previous years. The NSF contribution was \$139 million in 2004 but has declined steadily since then and declined further to just \$46 million in 2007; the 2008 request would stay at \$46 million, but would allow \$30 million for new grants. The ED portion of the program remains at \$182 million in 2008.

Through its research directorates, NSF would expand its participation in several multi-agency initiatives in 2008. NSF's contribution as the lead agency in the National Nanotechnology Initiative would climb 4.6 percent to \$390 million in 2008, with major funding split between ENG and MPS. NSF is also the lead agency in the Networking and Information Technology R&D (NITRD) initiative; NSF's contribution would jump 10.0 percent to \$994 million, with the majority of support coming from CISE and OCI. NSF also participates in the Climate Change Science Program (CCSP) with a \$208 million contribution (up 1.5 percent), mostly from GEO.

NSF Funding Mechanisms

The large proposed increases for the research directorates would mean a second year of gains to reverse recent declines in competitively awarded research grants. Looking only at competitively awarded research grants, NSF's core funding mechanism, NSF expects to fund 7,435 research grants next year, an 8 percent increase, while at the same time increasing the average award size to \$147,200 (up 3.0 percent) after several years of flat funding. After several years of declining success rates, NSF projects that it will fund 21 percent of research grant proposals, up slightly from 20 percent in 2007. The broad-based increases would allow every research directorate (excluding the new OCI) to increase the three key measures of the number of research grants, the average grant size, and the projected success rate.

NSF Research Portfolio and Performers

NSF is the only federal agency with responsibility for research in all major science and engineering fields. NSF has a balanced research portfolio covering the breadth of science and engineering, with roughly equal shares for the broad disciplinary groupings of physical sciences, environmental sciences, engineering, and mathematics/computer sciences, followed closely by biological sciences. In most fields, NSF is the largest or second-largest source of federal funding.

The FY 2007 and proposed FY 2008 increases should benefit NSF support for most science and engineering disciplines after cuts in 2005 and 2006 (see Figure 3, with data through 2006 only). In the past, NSF has distributed its increases unevenly depending on then-current research priorities. In particular, NSF support for computer sciences research has increased dramatically over the past decade, as fundamental IT research has grown as a national priority. NSF support of engineering research has also grown substantially over the last decade because of the growth in IT and nanotechnology research. The 2007 and 2008 budgets, with their relatively evenly distributed increases, should bring funding for most disciplines in Figure 3 above or near their 2004 peak funding levels.

NSF's longstanding leadership role in federal support of basic research continues to have a big impact on the nation's colleges and universities. NSF sends 79 percent of its R&D support to colleges and universities, by far the highest ratio of any R&D funding agency. NSF is the second-largest federal supporter of academic R&D, behind the National Institutes of Health (NIH), and dominates federal support in most non-biomedical fields.

Outlook for the NSF Budget

The 2008 NSF budget now goes to the 110th Congress, which just this month endorsed a large increase for the agency in the joint funding resolution that wrapped up 2007 appropriations. The delayed but ultimately positive 2007 appropriations cycle for NSF portends well for another substantial increase for NSF in 2008. Now that both the Bush Administration and the Congress have expressed support for the ACI, the outlook for sustained increases for NSF next year and in future years is the brightest it has been in a decade.

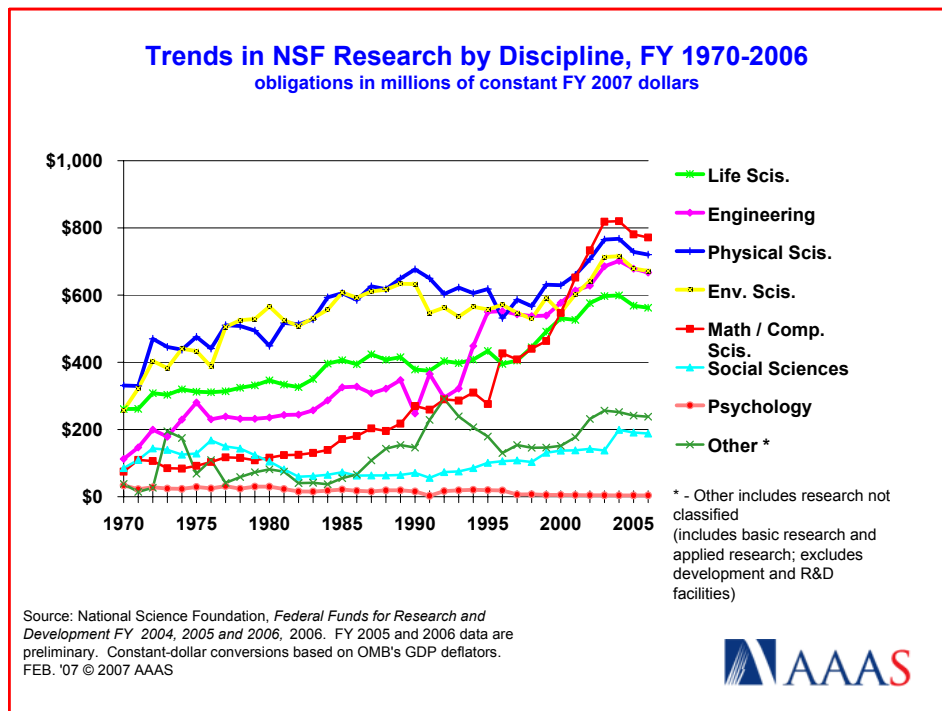


Figure 3. (click on the image for PDF)

(More materials on R&D in the FY 2008 budget, historical data and charts, and more information on *AAAS Report XXXII: Research and Development FY 2008*, can be found on the AAAS R&D Web site at <http://www.aaas.org/spp/rd>.)

- February 21, 2007
AAAS R&D Budget and Policy Program
1200 New York Avenue, NW
Washington, DC 20005
(202) 326-6607
AAAS R&D Web site: <http://www.aaas.org/spp/rd>



Table II-7. NSF R&D

Table II-7. R&D in the National Science Foundation
(budget authority in millions of dollars) *

	FY 2006	FY 2007	FY 2008	Change FY 07-08	
	Actual	Estimate**	Budget	Amount	Percent
1. Research and Related Activities (R&RA)					
Mathematical and Physical Sciences (MPS)					
Astronomical Sciences	200	215	233	18	8.3%
Chemistry	181	191	211	19	10.2%
Materials Research	243	257	283	25	9.8%
Mathematical Sciences	200	206	223	18	8.6%
Physics	234	249	269	21	8.3%
Multidisciplinary Activities	30	32	34	2	6.1%
Total MPS	1,087	1,150	1,253	103	8.9%
Engineering (ENG)					
Chem, Bioeng, Env & Transport	125	124	145	21	16.5%
Civil, Mechanical & Manuf. Innov	149	152	174	22	14.4%
Electrical Commun & Cyber Sys	78	81	94	13	16.1%
Industrial Innovation Partnersh.	110	120	128	8	6.9%
- SBIR/ STTR	99	109	116	8	6.9%
Engineering Edu. & Centers	124	126	117	-9	-7.2%
Emerging Frontiers in Res. Innov	0	25	25	0	0.0%
Total ENG	585	629	683	55	8.7%
Biological Sciences (BIO)					
Molecular and Cellular Bioscis	108	111	116	5	4.6%
Integrative Organismal Systems	101	101	105	5	4.7%
Environmental Biology	107	110	115	5	4.6%
Biological Infrastructure	82	86	96	10	11.9%
Emerging Frontiers	82	99	99	0	0.0%
Plant Genome Research	101	101	101	0	0.0%
Total BIO	581	608	633	25	4.1%
Geosciences (GEO)					
Atmospheric Sciences	216	227	241	14	6.2%
Earth Sciences	140	152	163	11	7.2%
Innov. & Collab. Edu. & Res.	58	59	59	0	0.0%
Ocean Sciences	289	307	329	22	7.2%
Total GEO	704	745	792	47	6.3%
Computer and Information Science and Engineering (CISE)					
Computing & Communic. Foun.	105	123	149	26	21.4%
Computer & Network Sys.	141	163	192	29	17.8%
Info. & Intelligent Sys.	104	119	155	35	29.6%

(continued)

Table II-7. NSF R&D

Table II-7 (continued). R&D in the National Science Foundation
(budget authority in millions of dollars) *

	FY 2006	FY 2007	FY 2008	Change FY 07-08	
	Actual	Estimate**	Budget	Amount	Percent
Information Tech. Research	146	122	78	-43	-35.7%
Total CISE	496	527	574	47	9.0%
Office of Cyberinfrastructure	127	182	200	18	9.6%
Social, Behavioral, and Economic Sciences (SBE)					
Social & Economic Scis.	94	100	103	3	3.5%
Behavioral & Cognitive Scis.	81	84	88	4	4.2%
Science Resources Statistics	27	30	31	1	4.3%
Total SBE	201	214	222	8	3.9%
Office of International Sci & Eng	43	41	45	4	10.8%
US Polar Programs					
Arctic Sciences	74	90	96	7	7.5%
Antarctic Sciences	48	57	64	8	13.2%
Antarctic Infra. & Logistics	203	229	241	12	5.3%
Polar Env., Safety & Health	5	6	6	1	9.5%
Polar Icebreaking 1/	60	57	57	0	0.0%
Total Polar Programs	391	438	465	27	6.1%
Integrative Activities 2/	233	230	263	33	14.6%
- EPSCoR 2/ 4/	98	100	107	7	7.0%
- Major Res. Instrumentation	88	90	114	24	27.2%
Arctic Research Commission	1	1	1	0	2.8%
BA Adjustment *	-12	0	0	0	--
Total R&RA *	4,437	4,764	5,132	368	7.7%
2. Major Research Equip. & Facils.	191	191	245	54	28.2%
3. Education & Human Resources (EHR) 3/					
Research on Learning in Formal and Informal Settings					
and Informal Settings	216	216	223	7	3.2%
Undergraduate Education	212	212	210	-2	-0.8%
Graduate Education	153	153	170	16	10.7%
Human Resource Develop.	120	120	148	29	23.9%
BA Adjustment *	-2	-2	0	2	--
Total EHR	698	698	751	52	7.5%

(continued)

Table II-7. NSF R&D

Table II-7 (continued). R&D in the National Science Foundation
(budget authority in millions of dollars) *

	FY 2006	FY 2007	FY 2008	Change FY 07-08	
	Actual	Estimate**	Budget	Amount	Percent
4. Agency Ops. & Award Mgmt. 5/	247	247	286	39	15.7%
5. National Science Board	4	4	4	0	2.0%
6. Inspector General	11	11	12	1	8.8%
Total NSF Budget *	5,589	5,916	6,429	513	8.7%
Deduct non-R&D Activities:					
<i>R&RA non-R&D</i>	-508	-536	-590	54	10.1%
<i>EHR non-R&D</i>	-635	-635	-681	46	7.2%
<i>Agency Ops. & Award Mngmt.</i>	-247	-247	-286	39	15.7%
<i>National Science Board</i>	-4	-4	-4	0	2.0%
<i>Inspector General</i>	-11	-11	-12	1	8.8%
Total NSF R&D	4,183	4,482	4,856	374	8.3%
Conduct of R&D	3,777	4,058	4,358	300	7.4%
R&D Facilities	406	424	498	73	17.3%

Source: NSF budget justification and Quantitative Data Tables.

* - Directorate detailed figures are in obligations. BA adjustment converts obligations to budget authority.

** - **FY 2007 figures are estimates of final FY 2007 appropriations in Public Law 110-5.**

1/ Transfer to Coast Guard for polar icebreaking costs.

2/ Includes proposed transfer of EPSCOR program from E.H.R. to R&RA in all years.

3/ FY 2008 budget proposes to restructure E.H.R. accounts.

All years shown in proposed new structure for comparability.

4/ Experimental Program to Stimulate Competitive Research.

5/ Formerly Salaries and Expenses.

AAAS - February 21, 2007 - REVISED

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

Please see Chapter 7 for information on the NSF budget.