

Large Boost to NSF Proposed for 2007

AAAS R&D Funding Update on R&D in the FY 2007 NSF Budget

(This analysis is a preview of the NSF chapter in the forthcoming *AAAS Report XXXI: Research and Development FY 2007*, a comprehensive look at the President's budget for R&D in FY 2007. 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 2007 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 Bush Administration's American Competitiveness Initiative to boost physical sciences research with a 7.9 percent boost for its budget to \$6.0 billion in FY 2007** (see Table II-7). The requested increase would benefit all disciplines in NSF's research portfolio.

- **NSF R&D funding (excluding education, training, and overhead costs) would surge 8.3 percent to \$4.5 billion after several years of flat funding to reach an all-time high in real terms.**

- Most research directorates would receive increases between 5 and 9 percent after several years of flat or declining funding. All the research directorates would increase average award sizes, numbers of research grants, and success rates for research grant applications.

- Although the large 2007 boost is intended to be the first year of a 10-year NSF doubling effort, it is worth remembering that Congress and President Bush agreed on an NSF authorization in 2002 promising a 5-year doubling effort by 2007; the 2007 request falls nearly \$4 billion short of that previous doubling target.

- NSF's Education and Human Resources (E.H.R.) budget would increase just 2.5 percent to \$816 million in 2007, and would remain 20 percent below the 2004 funding level in real terms.

NSF R&D in the FY 2007 Budget

President Bush's proposed FY 2007 budget proposes substantial increases for key physical sciences research agencies as part of an "American Competitiveness Initiative" (ACI) that was first previewed in his State of the Union address in response to a growing wave of concern about the state of U.S. innovation. The ACI proposes to double funding for three key physical sciences 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 substantial increase in the 2007 budget after years of flat or declining funding.

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 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 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. Most of its funding is in the form of competitively awarded research grants or competitively awarded research centers.

The total NSF budget would climb 7.9 percent or \$439 million to \$6.0 billion (see Table II-7 and Figure 1) after only a small increase in 2006 and a cut in 2005. The American Competitiveness Initiative envisions sustained increases in 2008 and later years leading to a doubling of the NSF budget by 2016, but as with all budgets the FY 2007 budget request is only for one year of that vision.

But on a cautionary note, the ACI doubling vision recalls failed NSF doubling plans in the past. The most recent one was an NSF authorization law calling for a doubling of the NSF budget between FY 2002 and FY 2007, which was signed into law in December 2002. Authorizations are only plans and not actual dollars, but unlike the ACI so far the authorization was written into federal law after agreement from both Congress and President Bush. But with the return of budget deficits and the subsequent tightening of domestic budgets, neither the President nor the Congress has provided anything resembling the authorized amounts in subsequent budgets (see Figure 1). The authorization envisioned a 2007 NSF budget of \$9.8 billion, double the 2002 level, but the FY 2007 request would fall nearly \$4 billion short as it resets the clock to a new doubling plan.

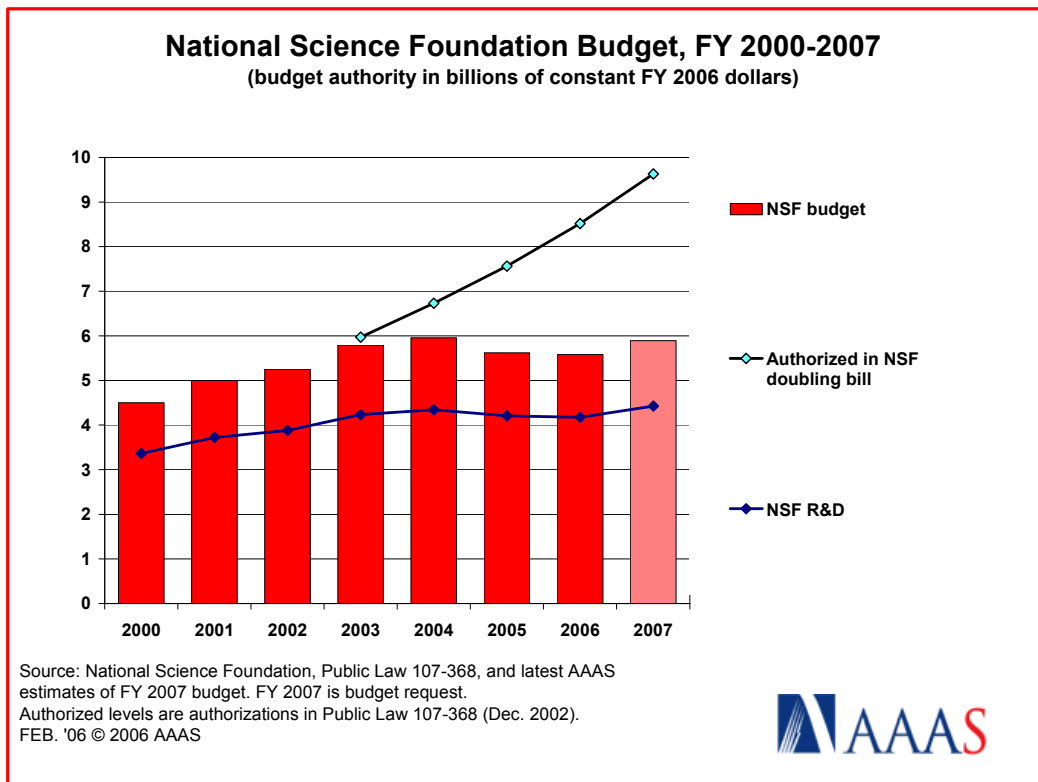


Figure 1. (click on the image for PDF)

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 \$4.5 billion, a gain of \$348 million or 8.3 percent that would bring the R&D total slightly above 2004 levels in inflation-adjusted terms (see Figure 1), after cuts in 2005 and 2006.

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 \$4.7 billion (see Table II-7). Most research directorates would receive increases between 5 and 9 percent 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 44 percent to \$182 million. OCI supports the procurement, development, and operation of state-of-the-art cyberinfrastructure resources for the entire research community. The increase would go toward making a petascale high-performance computing system available, and toward new software and collaborative tools needed for researchers to take advantage of high-performance computing. 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 \$438 million, a boost of 12.5 percent. The OPP increase would go to ramp up research during the International Polar Year (2007-2008) and for increased logistics costs to support that research. OPP would also continue to fund icebreaker ships necessary for research access to the Arctic and Antarctic; these had traditionally been funded by the Coast Guard, but in 2006 NSF takes over funding and would pay the Coast Guard \$57 million (down \$1 million) in 2007 while the National Academy of Sciences completes a study on how NSF can meet its future icebreaking needs.

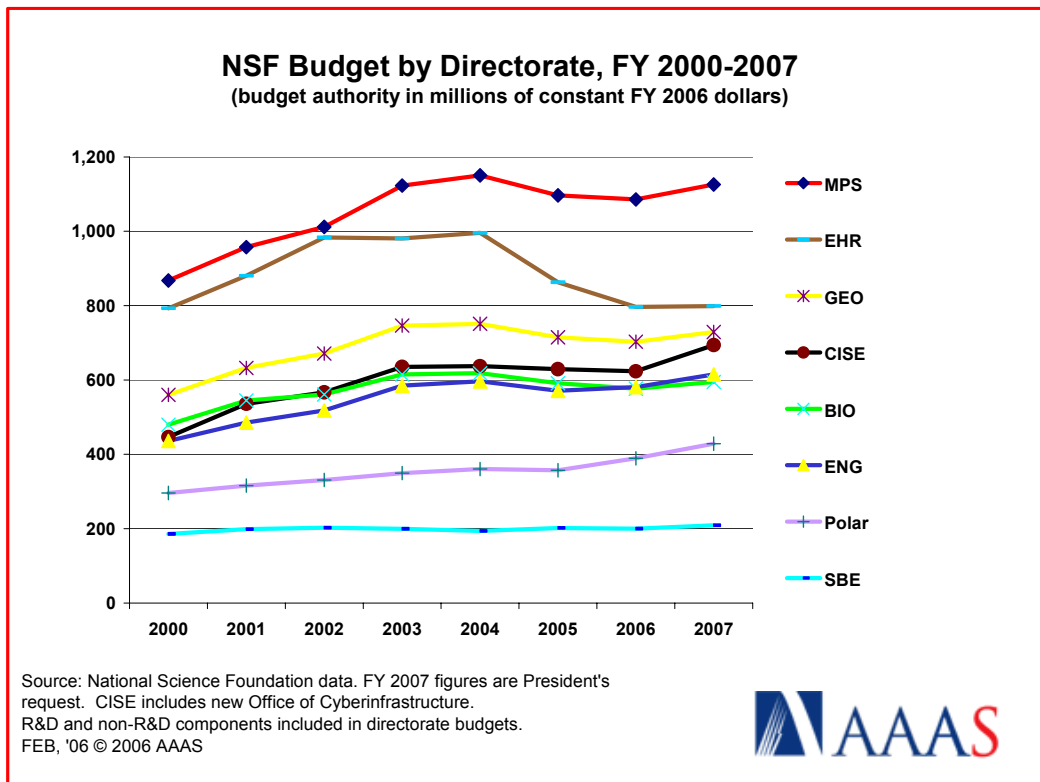


Figure 2. (click on the image for PDF)

Even after the substantial 2007 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 Mathematical and Physical Sciences (MPS), Geosciences (GEO), Biological Sciences (BIO), and the Social, Behavioral and Economic Sciences (SBE) directorates would remain below 2004 funding levels even if the 2007 increases are approved, while the CISE, Polar, and Engineering (ENG) directorates would reach new highs. Overall, NSF R&D would narrowly surpass the inflation-adjusted 2004 budget in 2007.

The Major Research Equipment and Facilities Construction (MREFC) account would receive a 26.0 percent or \$50 million boost to \$240 million in the 2007 budget (see Table II-7). MREFC funds only the construction of large scientific facilities; smaller facilities construction projects, planning and design for future facilities, research instrumentation grants, and facilities operations are funded in R&RA by the research directorates. From funding just 4 projects in 2006, the MREFC increase would allow funding for 8 projects, two of them new starts. Construction of the Atacama Large Millimeter Array (ALMA; an astronomy project), EarthScope (earth sciences), IceCube (a neutrino observatory at the South Pole), and

the Scientific Ocean Drilling Vessel (SODV, for ocean research) would continue in FY 2007, while the National Ecological Observatory Network (NEON), a long-delayed ecological research project, may finally receive construction funding in FY 2007 and the South Pole Station Modernization (SPSM) project would resume in 2007 after a funding pause. The two new starts would be the Alaska Region Research Vessel, a \$56 million request to replace an aging arctic research vessel, and the Ocean Observatories Initiative, a \$14 million request to build an integrated ocean observing network.

The total NSF investment in R&D facilities and major equipment would be \$473 million in 2007, an \$80 million increase. Outside MREFC, the largest other source of funding would be the Major Research Instrumentation (MRI) program in the R&RA Integrative Activities account. MRI would receive \$90 million in 2007, up \$1.6 million from the current year, 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.

NSF education and human resources programs would increase modestly, but would remain 20 percent below 2004 levels in real terms. NSF proposes an **Education and Human Resources (EHR)** budget of \$816 million, up a relatively modest 2.5 percent. But since the EHR budget was \$945 million as recently as 2004, the 2007 increase would do little to reverse steep cuts in the past two years (see Figure 2). Much of the fall is due to a shift in the Math and Science Partnerships (MSP) program from a joint Department of Education (ED)-NSF program to an Education-only one. The NSF contribution was \$139 million in 2004 but has declined steadily since then and would decline further to just \$46 million in 2007, while the ED program is now \$182 million and would remain at that level in 2007. The EHR budget would be restructured in 2007 and most program areas would receive increases. The Experimental Program to Stimulate Competitive Research (EPSCoR) would receive \$100 million, up slightly. 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.

Through its research directorates, NSF would expand its participation in several multi-agency initiatives in 2007. NSF's contribution as the lead agency in the National Nanotechnology Initiative would climb 8.4 percent to \$373 million in 2007, with major funding split between Engineering (ENG) and Mathematics and Physical Sciences (MPS). NSF is also the lead agency in the Networking and Information Technology R&D (NITRD) initiative; NSF's contribution would jump 11.6 percent to \$904 million, with the majority of support coming from CISE and OCI. NSF also participates in the Climate Change Science Program (CCSP) with a \$205 million contribution (up 4.1 percent), mostly from the Geosciences (GEO) directorate.

NSF Funding Mechanisms

The large proposed increases for the research directorates would begin 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 6,760 research grants next year, a 9 percent increase over 2006, while at the same time increasing the average award size to \$148,300 (up 3.7 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 the last two years. The broad-based increases would allow every research directorate to increase the three key measures of the number of research grants, the average grant size, and the projected success rate. For grant numbers, CISE, ENG, and the new Office of Cyberinfrastructure would all see increases greater than 10 percent.

Outlook for the NSF Budget

Because the American Competitiveness Initiative is a high priority in the FY 2007 budget, NSF would receive an increase even as most other domestic agencies face cuts within a declining domestic budget. Looking to the future, the Bush Administration's outyear budget projections show that in the push to reduce the budget deficit in half over the next few years, funding for most domestic programs would decline each year to 2011, but funding for NSF and the other two ACI programs would continue to

increase in the outyears. The projections show the NSF budget increasing steadily from \$6.0 billion in 2007 up to \$7.9 billion by 2011. After adjusting for inflation, NSF would gain 31 percent over the next five years. Although budgets are always determined one year at a time, and Congress has not even acted on the first installment for 2007, Congress has so far been supportive of the Administration's proposed 2007 increase for NSF, and key appropriators have promised to sustain most if not all of the increase in 2007 appropriations. Thus, the outlook for the NSF budget is brighter than it has been for several years.

(More materials on R&D in the FY 2007 budget, historical data and charts, and more information on *AAAS Report XXXI: Research and Development FY 2007*, can be found on the AAAS R&D Web site at <http://www.aaas.org/spp/rd>.)

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Table II-7. NSF R&D

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

	FY 2005 Actual	FY 2006 Estimate	FY 2007 Budget	Change FY 06-07 Amount Percent	
1. Research and Related Activities (R&RA)					
Mathematical and Physical Sciences (MPS)					
Astronomical Sciences	195	200	215	15	7.7%
Chemistry	179	181	191	10	5.7%
Materials Research	240	243	257	15	6.0%
Mathematical Sciences	200	199	206	6	3.2%
Physics	225	233	249	15	6.6%
Multidisciplinary Activities	30	30	32	3	9.2%
Total MPS	1,069	1,085	1,150	65	6.0%
Engineering (ENG)					
Chem, Bioeng, Env & Transport	112	123	124	2	1.3%
Civil, Mechanical & Manuf. Innov	141	147	152	5	3.7%
Electrical Commun & Cyber Sys	71	77	81	4	4.7%
Industrial Innovation Partnersh.	113	111	120	10	8.6%
- SBIR/ STTR	103	100	109	9	8.5%
Engineering Edu. & Centers	120	123	126	3	2.1%
Emerging Frontiers in Res. Innov	0	0	25	25	--
Total ENG	557	581	629	48	8.2%
Biological Sciences (BIO)					
Molecular and Cellular Bioscis	118	108	111	3	2.7%
Integrative Organismal Biology	103	100	101	0	0.3%
Environmental Biology	106	107	110	3	2.7%
Biological Infrastructure	81	82	86	4	5.0%
Emerging Frontiers	74	81	99	18	22.7%
Plant Genome Research	94	99	101	3	2.5%
Total BIO	577	577	608	31	5.4%
Geosciences (GEO)					
Atmospheric Sciences	215	216	227	11	5.0%
Earth Sciences	137	140	152	12	8.7%
Innov. & Collab. Edu. & Res.	54	58	59	0	0.3%
Ocean Sciences	291	288	307	19	6.5%
Total GEO	697	703	745	42	6.0%
Computer and Information Science and Engineering (CISE)					
Computing & Communic. Foun.	91	105	123	17	16.5%
Computer & Network Sys.	132	142	163	21	15.2%
Info. & Intelligent Sys.	92	104	119	16	15.1%

(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 2005	FY 2006	FY 2007	Change FY 06-07	
	Actual	Estimate	Budget	Amount	Percent
Information Tech. Research	174	146	122	-24	-16.6%
Total CISE	490	496	527	30	6.1%
Office of Cyberinfrastructure 1/	123	127	182	55	43.5%
Social, Behavioral, and Economic Sciences (SBE)					
Social & Economic Scis.	92	93	100	7	7.3%
Behavioral & Cognitive Scis.	79	80	84	4	5.5%
Science Resources Statistics	26	27	30	3	10.1%
Total SBE	197	200	214	14	6.9%
Office of International Sci & Eng	43	35	41	6	17.6%
US Polar Programs					
Polar Research Programs 2/	278	323	371	48	14.8%
Antarctic Logistical Support	70	67	68	1	1.3%
Total Polar Programs	349	389	438	49	12.5%
Integrative Activities	131	137	131	-6	-4.2%
Arctic Research Commission 3/	1	1	1	0	23.9%
BA Adjustment *	-5	0	0	0	--
Total R&RA *	4,230	4,331	4,666	334	7.7%
2. Major Research Equipment & Facilities Construction	174	191	240	50	26.0%
3. Education & Human Resources (EHR) 4/					
Research on Learning in Formal and Informal Settings 4/	239	215	215	0	-0.1%
EPSCoR 5/	93	99	100	1	1.3%
Undergraduate Education 4/	238	212	197	-15	-7.0%
Graduate Education	155	153	161	8	4.9%
Human Resource Develop. 4/	119	118	144	26	21.8%
BA Adjustment *	-2	0	0	0	--
Total EHR	841	797	816	20	2.5%

(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 2005	FY 2006	FY 2007	Change FY 06-07	
	Actual	Estimate	Budget	Amount	Percent
4. Salaries and Expenses	223	247	282	35	14.2%
5. National Science Board	4	4	4	0	-1.0%
6. Inspector General	10	11	12	1	4.4%
Total NSF Budget *	5,482	5,581	6,020	439	7.9%
Deduct non-R&D Activities:					
<i>R&RA non-R&D</i>	-451	-488	-528	40	8.2%
<i>EHR non-R&D</i>	-692	-657	-672	16	2.4%
<i>Salaries and Expenses</i>	-223	-247	-282	35	14.2%
<i>National Science Board</i>	-4	-4	-4	0	-1.0%
<i>Inspector General</i>	-10	-11	-12	1	4.4%
Total NSF R&D	4,102	4,175	4,523	348	8.3%
Conduct of R&D	3,738	3,782	4,049	268	7.1%
R&D Facilities	364	393	473	80	20.5%

Source: NSF budget justification and Quantitative Data Tables.

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

1/ New organization in 2005. Transfer of some CISE activities to new office.

2/ FY 2006 and FY 2007 figures include transfer from Coast Guard of polar icebreaking responsibilities.

3/ Currently funded in Polar Programs. FY 2007 budget proposes separate line item.

4/ FY 2007 budget proposes to restructure E.H.R. accounts.

All years shown in proposed new structure for comparability.

5/ Experimental Program to Stimulate Competitive Research.

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

Please see Chapter 7 for information on the NSF budget.