

## FY '05 Budget Offers NSF Modest Increase But Falls Short of Authorized Level

### AAAS R&D Funding Update on R&D in the FY 2005 NSF Budget

(This analysis is a preview of the NSF chapter in the forthcoming *AAAS Report XXIX: Research and Development FY 2005*, a comprehensive look at the President's budget for R&D in FY 2005. This analysis contains revised AAAS estimates of NSF R&D, different from figures presented in the AAAS Preliminary Analysis of February 5. More tables and continually updated supplemental materials on R&D in the FY 2005 budget can be found on the AAAS R&D Web site at <http://www.aaas.org/spp/rd>.)

#### Highlights

- Within the total National Science Foundation (NSF) budget, up 3.0 percent to \$5.7 billion in FY 2005, **most research directorates would receive increases of about 2 percent** (see Table II-7).
- The NSF budget of \$5.7 billion would be far short of the \$7.4 billion FY 2005 authorization signed into law a year ago as part of a plan to double the NSF budget in the five years to FY 2007. The Bush Administration's budget plans assume a \$5.6 billion NSF budget in FY 2007, \$4.2 billion short of the \$9.8 billion authorized for that year.
- **NSF's R&D funding would total \$4.2 billion in FY 2005, an increase of \$149 million or 3.6 percent** (see Table II-7).
- The Major Research Equipment and Facilities Construction (MREFC) account would enjoy a sizeable increase, going from \$155 million to \$213 million because of three proposed starts (the National Ecological Observatory Network, an ocean-drilling project, and Rare Symmetry Violating Processes).
- The request proposes to move funding for the **Math and Science Partnerships** from Education and Human Resources (E.H.R) to the Research and Related Activities (R&RA) account, and cut its funding from \$140 million down to \$80 million.
- **The small increases for the research directorates would squeeze NSF funding of competitively awarded research grants.** The total number of NSF research grants would fall by 72 down to 6,145 in FY 2005, and the competition for them would get harder. NSF expects to make awards to less than one in four applications this year. Even successful applicants may be disappointed: the average size of an NSF research grant would rise only 2.2 percent in FY 2005, barely above the expected rate of inflation.

#### Overview of the NSF Budget

**The FY 2005 budget request of \$5.7 billion for NSF would be a \$167 million (or 3.0 percent) increase over this year's budget** (see Table II-7). The FY 2004 budget was only signed into law at the end of January; until then, NSF had been operating at FY 2003 funding levels since October 1.

An NSF authorization bill calling for a doubling of the NSF budget between FY 2002 and FY 2007 was signed into law in December 2002, but the FY 2004 appropriation fell \$1 billion short of the authorized \$6.6 billion funding level for FY 2004. **The gap widens in the FY 2005 budget to \$1.6 billion, the distance between the \$5.7 billion Administration request and the \$7.4 billion authorized level, putting the NSF doubling goal well out of reach in these tough budgetary times.** By FY 2007, the

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envisioned conclusion of the doubling campaign with an authorized NSF budget of \$9.8 billion, the Bush budget plan projects an NSF budget of only \$5.6 billion, below even the FY 2005 budget and \$4.2 billion short of the \$9.8 billion authorized for that year.

**NSF's R&D funding, which excludes NSF's education and training activities and overhead costs, would total \$4.2 billion, an increase of 3.6 percent or \$149 million (see Table II-7).**

The **Research and Related Activities (R&RA)** account, which funds most of NSF's R&D, would receive \$4.5 billion, 4.7 percent or \$201 million more than FY 2004. **The research directorates would receive increases of about 2 percent**, except for Social, Behavioral, and Economic (SBE) Sciences with a proposed increase of 10.3 percent. The Mathematical and Physical Sciences (MPS), Biological Sciences (BIO), Computer and Information Science and Engineering (CISE) and Geosciences (GEO) directorates would all increase by 2.2 percent in FY 2005.

The Integrative Activities (IA) account within R&RA would jump to \$240 million, an increase of \$96 million, but \$80 million would be due to the proposed transfer of the **Math and Science Partnerships from Education and Human Resources (E.H.R) to IA, along with a proposed cut in its funding from \$139 million down to \$80 million.** The MSP program, run jointly by NSF and the Department of Education, encourages academic institutions and schools to work together to improve math and science education. The FY 2005 budget requests \$269 million for the Department of Education's (ED) share of the program, up dramatically from \$149 million this year. Combined, the MSP programs would receive \$349 million in FY 2005, up from \$288 million this year, and would reflect the Bush Administration's desire to shift the emphasis of the program toward ED. Elsewhere in the IA account, funding for the Major Research Instrumentation (MRI) program would fall from \$109 million down to \$90 million. The MRI program awards competitive grants to universities and colleges to purchase scientific and engineering equipment and instrumentation to be used for research and training; in response to congressional concerns, at least \$25 million of the funding would go toward minority-serving institutions. Also in IA, Science of Learning Centers is a relatively new program for learning research across disciplines, with \$20 million this year and the same amount next year, both ten times the initial \$2 million investment last year.

Within a relatively tight budget, there would be little room for larger increases. **NSF participation in the Nanoscale Science and Engineering Initiative, however, would buck the trend with a 20 percent increase to \$305 million** across the directorates, with major funding for this initiative split between Engineering (ENG) and MPS. NSF priorities in this multi-agency initiative with a \$982 million budget across 10 agencies would include nanobiotechnology, nanoscale manufacturing, and instrumentation, focused on the NSF specialties of long-term fundamental research, research infrastructure, and interdisciplinary centers. Overall NSF participation in another multi-agency initiative, Networking and Information Technology R&D (NITRD), would barely increase to \$761 million. Most of NSF's part of the seven-agency NITRD investment would take place in the CISE directorate, proposed for only a 2.2 percent gain to \$618 million.

NSF's **Education and Human Resources (EHR)** programs would receive \$771 million, down a dramatic \$168 million from this year. Most of the decline is due to the shift of the **Math and Science Partnerships (MSP)** program to R&RA. The FY 2005 budget contains \$84 million for the Experimental Program to Stimulate Competitive Research (EPSCoR), \$10 million less than this year. 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.

### **NSF Funding Mechanisms**

**The small increases for the research directorates would squeeze NSF funding of competitively awarded research grants. The success rate for NSF research grant applications would dip to 23 percent** in FY 2005, down one percentage point from the past few years. Among some directorates, the odds of success would be even lower. ENG expects to fund only 15 percent of its research grant

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applications, while BIO would fund less than one in five (19 percent), both down one percentage point from this year and two points from last year.

Although the number of research grants awarded has been on a steady upward trend in recent years, **NSF expects to fund only 6,145 research grants in FY 2005, down by 72 from this year's expected total.** Again, BIO and ENG expect large declines, with BIO funding 2.6 percent fewer grants and EMG funding 3.7 percent fewer. The MPS directorate expects to fund 1,610 research grants in FY 2005, 40 fewer than this year.

For successful applicants, the good news is that NSF has made it a high priority to increase the average duration of a research grant. From an NSF-wide average of 2.9 years last year, the average grant would be 3.0 years this year and next year, with similar trends in all the research directorates.

The bad news for successful applicants, however, is that many research grant awards would fail to keep pace with inflation. **The 2.2 percent average increase for NSF research grants between FY 2004 and FY 2005 to \$142,000 would be just ahead of the 1.3 percent expected rate of inflation for the economy as a whole, but several directorates would fail to keep pace.** The average ENG (\$119,500) and GEO (\$147,900) research grant would not increase at all, and the average CISE grant (\$165,000) would increase just 0.9 percent. The NSF-wide increase would be skewed by a 5.0 percent increase in the average BIO research grant to \$190,750.

On the other hand, NSF funding of research centers would continue to be a growth area in FY 2005 for a total of \$457 million in FY 2005, up 10.7 percent from this year across most of NSF's funding areas. These multi-year multidisciplinary commitments of funds, mostly to universities, have grown in importance within NSF budget over the past decade and would hit an all-time high of nearly 11 percent of the R&D portfolio in FY 2005.

**NSF would also expand its support of R&D facilities, for a total of \$686 million in FY 2005, an increase of 18.2 percent.** There would be \$213 million for the **Major Research Equipment and Facilities Construction (MREFC)** account, up dramatically from \$155 million this year. There would be three proposed starts (the National Ecological Observatory Network (NEON), the Scientific Ocean Drilling Vessel, and Rare Symmetry Violating Processes (RSVP)), with NEON a holdover from past requests that has yet to be funded by Congress. Two more projects (Ocean Observatories Initiative and the Alaska Region Research Vessel) are queued up for FY 2006 starts. The National Earthquake Engineering and Simulation project, the South Pole Station, and Terascale Computing Systems finish this year so no funds would be necessary in FY 2005. The MREFC appropriation only pays for the construction of major R&D facilities; the \$686 million total facilities investment takes in design and development of future facilities and operational costs of existing user facilities, which are open to the general scientific and engineering community for research. Outside the MREFC, the largest part of the facilities investment would be \$90 million for the Partnership for Advanced Computational Infrastructure (PACI) to create a national cyberinfrastructure designed to be an integrated system of state-of-the-art computing, communications, and information resources for research and education.

### **NSF Research Portfolio and Performers**

NSF is the only federal agency with responsibility for research in all major science and engineering fields. As shown in Figure 1, NSF has a **balanced research portfolio** covering the breadth of science and engineering. In most fields, NSF is the largest or second-largest source of federal funding.

The evenly distributed FY 2005 increase should benefit NSF support for most science and engineering disciplines. 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. But in many disciplines, NSF support is only now recovering from the lean years of the mid-1990s when NSF support for the physical sciences,

environmental sciences, the non-medical life sciences, and mathematics actually fell. The FY 2005 budget should at least maintain NSF support for all these disciplines at about the rate of inflation.

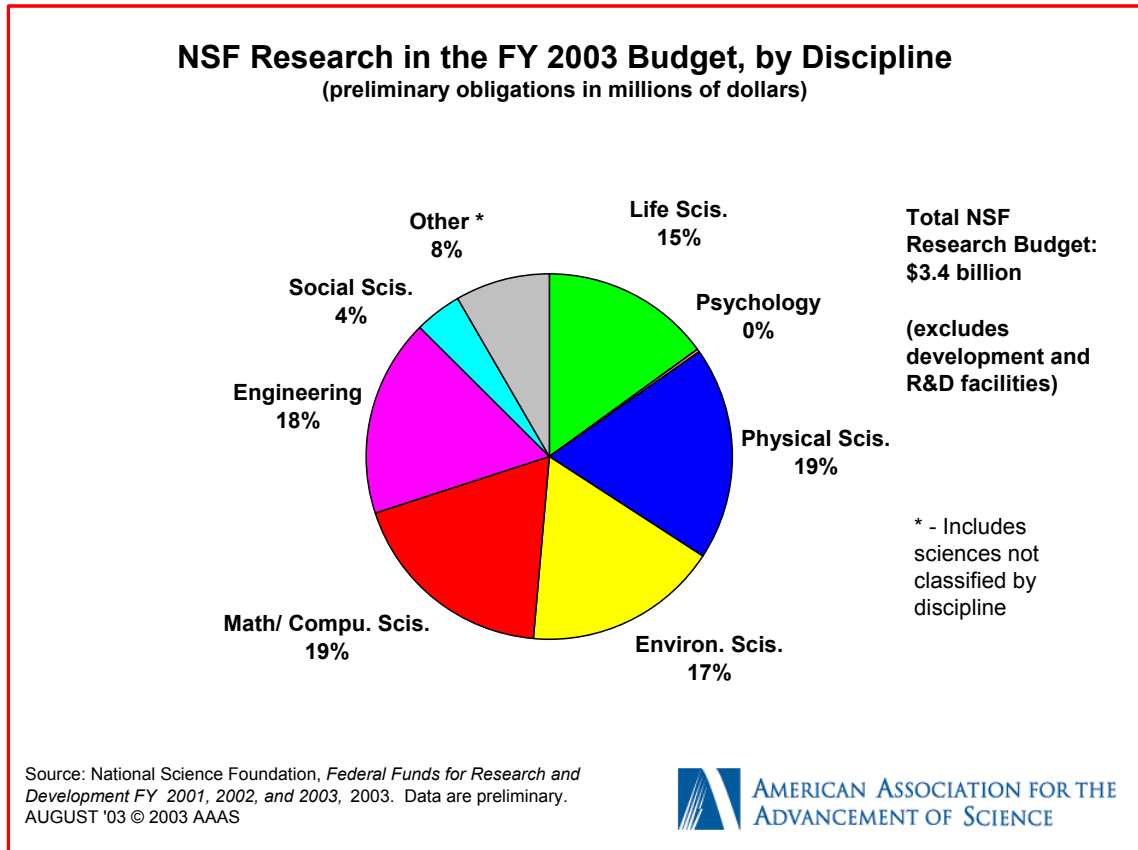


Figure 1. (click on the image to view or download a color, full-page PDF version of the chart)

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 81 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 NIH, and dominates federal support in most non-biomedical fields.

### Outlook and Historical Trends

NSF has enjoyed mostly steady budget growth over the past several decades, as shown in Figure 2. After declines in the mid-1990s in the push toward a balanced budget, growth resumed after FY 1998 and momentum began to build to double the NSF budget over five years, culminating in the NSF authorization bill of December 2002. But NSF budget growth slowed down to just ahead of the inflation rate in FY 2004, and would slow down further in FY 2005. As noted earlier, these smaller increases put the NSF budget further and further behind the authorized doubling path and have created downward pressures on NSF grant sizes and success rates. While there is strong political pressure for Congress to approve a budget more consistent with the authorized funding track, lawmakers have been stymied by tight restraints on overall domestic discretionary spending. In FY 2005, with overall domestic spending proposed to increase by just 0.5 percent, the restraints will be even tighter. If Congress agrees to these overall funding levels or even goes lower, then any increases for NSF above the request would have to be offset by cuts in other programs.

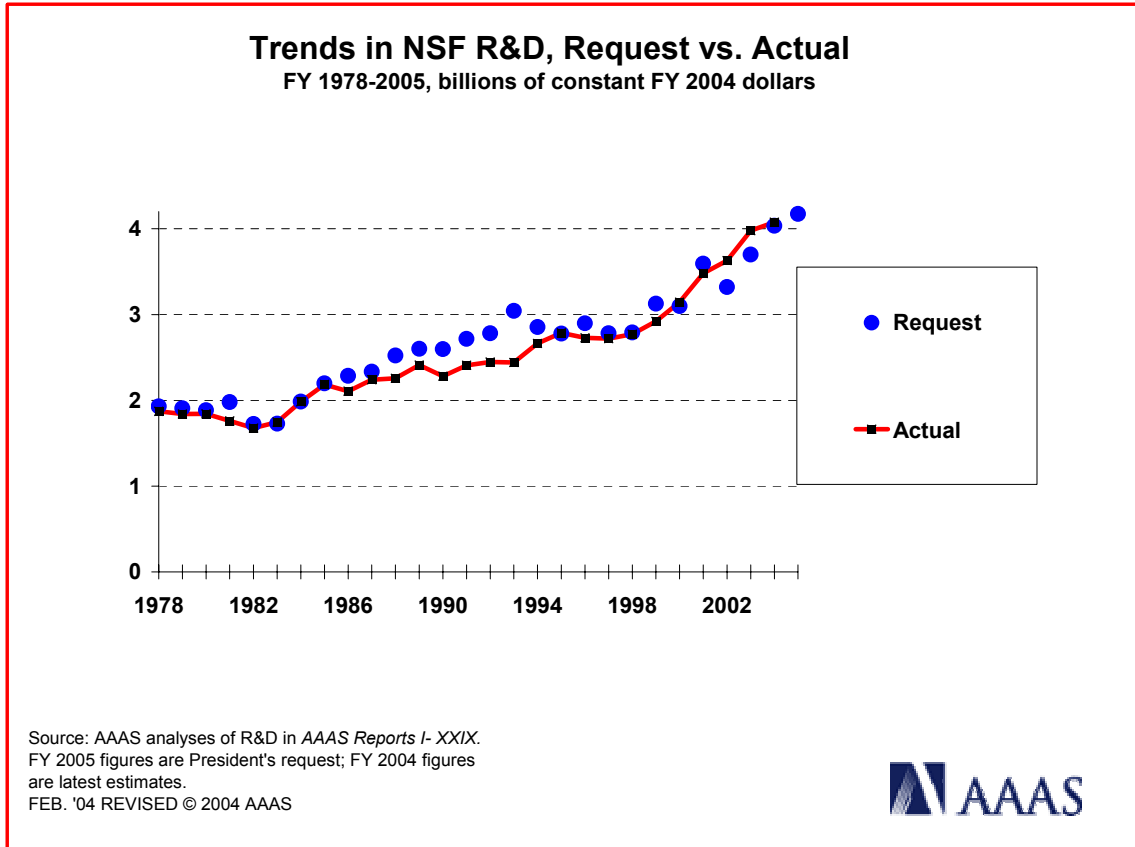


Figure 2. (click on the image to view or download a full-page color PDF version of the chart)

**Even the modest proposed increase for next year, however, looks good compared to what may lie in store.** With Congress and the President apparently committed to reducing the budget deficit in half within the next five years primarily through holding down domestic spending, the consequences for NSF are becoming clearer. The FY 2005 budget contains preliminary projections for the NSF budget out to FY 2009. **In FY 2006, the NSF budget would fall to \$5.6 billion**, giving back even the modest increase for next year, and increase to only \$5.7 billion in FY 2009, still below the FY 2005 budget. **After adjusting for expected inflation, the five-year Bush budget would leave NSF's R&D investments 5 percent below this year's funding level in 2009.**

- February 26, 2004

(More materials on R&D in the FY 2005 budget, historical data and charts, and more information on *AAAS Report XXIX: Research and Development FY 2005*, 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&amp;D

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

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Budget	Change FY 04-05	
				Amount	Percent
1. Research and Related Activities (R&RA)					
Mathematical and Physical Sciences (MPS)					
Astronomical Sciences	187	197	<b>204</b>	8	4.0%
Chemistry	182	185	<b>189</b>	4	2.0%
Materials Research	241	251	<b>253</b>	2	0.9%
Mathematical Sciences	179	200	<b>202</b>	2	0.9%
Physics	225	228	<b>236</b>	8	3.6%
Multidisciplinary Activities	27	31	<b>31</b>	0	0.9%
Total MPS	1,041	1,092	<b>1,116</b>	24	2.2%
Engineering (ENG)					
Bioengineering & Env. Sys.	49	51	<b>50</b>	-1	-2.5%
Chemical & Transport System Design, Manufacture, & Industrial Innovation	68	69	<b>67</b>	-2	-2.5%
Electrical & Commun. Sys.	155	169	<b>170</b>	1	0.3%
Engineering Edu. & Centers	73	75	<b>73</b>	-2	-2.5%
Civil & Mechanical Systems	133	134	<b>131</b>	-3	-2.5%
	63	67	<b>86</b>	18	27.3%
Total ENG	542	565	<b>576</b>	11	1.9%
Biological Sciences (BIO)					
Molecular and Cellular Biosci.	122	122	<b>125</b>	3	2.6%
Integrative Biology & Neurosci.	107	107	<b>111</b>	3	3.0%
Environmental Biology	108	108	<b>111</b>	3	3.0%
Biological Infrastructure	75	80	<b>85</b>	5	6.5%
Emerging Frontiers	73	80	<b>78</b>	-2	-2.3%
Plant Genome Research	84	89	<b>89</b>	0	0.0%
Total BIO	570	587	<b>600</b>	13	2.2%
Geosciences (GEO)					
Atmospheric Sciences	231	239	<b>244</b>	5	2.0%
Earth Sciences	147	152	<b>156</b>	4	2.7%
Ocean Sciences	313	323	<b>329</b>	7	2.0%
Total GEO	692	713	<b>729</b>	15	2.2%
Computer and Information Science and Engineering (CISE)					
Computer & Network Sys.	117	115	<b>132</b>	17	15.2%
Computing & Communication Information & Intelligent Systems	81	79	<b>91</b>	12	15.8%
	82	80	<b>93</b>	12	15.6%

(continued)

Table II-7. NSF R&amp;D

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

	FY 2003	FY 2004	FY 2005	Change FY 04-05	
	Actual	Estimate	Budget	Amount	Percent
Shared Cyberinfrastructure	95	113	<b>124</b>	11	9.7%
Information Tech. Research	214	218	<b>178</b>	-40	-18.3%
<b>Total CISE</b>	<b>589</b>	<b>605</b>	<b>618</b>	<b>13</b>	<b>2.2%</b>
Social, Behavioral, and Economic Sciences (SBE)					
Social & Economic Scis.	71	81	<b>89</b>	8	9.3%
Behavioral & Cognitive Scis.	62	69	<b>76</b>	8	10.9%
Int'l. Sci. and Engineering	27	28	<b>34</b>	6	21.1%
Science Resources Statistics	25	26	<b>26</b>	0	0.0%
<b>Total SBE</b>	<b>185</b>	<b>204</b>	<b>225</b>	<b>21</b>	<b>10.3%</b>
US Polar Programs					
Polar Research Programs	255	274	<b>282</b>	8	2.8%
Antarctic Logistical Support	69	68	<b>68</b>	0	0.0%
<b>Total Polar Programs</b>	<b>324</b>	<b>342</b>	<b>350</b>	<b>8</b>	<b>2.2%</b>
Integrative Activities <sup>3</sup>	98	144	<b>240</b>	96	66.5%
BA Adjustment *	29	0	<b>0</b>	0	--
<b>Total R&amp;RA *</b>	<b>4,070</b>	<b>4,251</b>	<b>4,452</b>	<b>201</b>	<b>4.7%</b>
2. Major Research Equipment & Facilities Construction	150	155	<b>213</b>	58	37.6%
3. Education & Human Resources (EHR)					
Elem., Secondary, & Informal <sup>1</sup>	223	212	<b>173</b>	-40	-18.6%
Undergraduate Education	173	156	<b>159</b>	3	2.2%
Graduate Education	140	156	<b>174</b>	18	11.5%
Human Resource Develop.	99	116	<b>108</b>	-8	-6.8%
Math & Science Partnerships <sup>3</sup>	144	139	<b>0</b>	-139	-100.0%
Res., Eval., And Commun.	67	66	<b>74</b>	8	12.4%
EPSCoR <sup>2</sup>	89	94	<b>84</b>	-10	-11.1%
BA Adjustment *	-26	0	<b>0</b>	0	--
<b>Total EHR</b>	<b>909</b>	<b>939</b>	<b>771</b>	<b>-168</b>	<b>-17.9%</b>

(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 2003	FY 2004	FY 2005	Change FY 04-05	
	Actual	Estimate	Budget	Amount	Percent
4. Salaries and Expenses	190	219	<b>294</b>	75	34.4%
5. National Science Board	4	4	<b>4</b>	0	1.8%
6. Inspector General	9	10	<b>10</b>	0	1.7%
<b>Total NSF Budget *</b>	<b>5,332</b>	<b>5,578</b>	<b>5,745</b>	<b>167</b>	<b>3.0%</b>
<b>Deduct non-R&amp;D Activities:</b>					
<i>R&amp;RA non-R&amp;D</i>	-432	-467	<b>-571</b>	-105	22.4%
<i>EHR non-R&amp;D</i>	-770	-802	<b>-640</b>	162	-20.2%
<i>Salaries and Expenses</i>	-190	-219	<b>-294</b>	-75	34.4%
<i>National Science Board</i>	-4	-4	<b>-4</b>	0	1.8%
<i>Inspector General</i>	-9	-10	<b>-10</b>	0	1.7%
<b>Total NSF R&amp;D</b>	<b>3,926</b>	<b>4,077</b>	<b>4,226</b>	<b>149</b>	<b>3.6%</b>
Conduct of R&D	3,620	3,730	<b>3,844</b>	114	3.1%
R&D Facilities	306	347	<b>382</b>	35	10.0%

Source: NSF budget justification and Quantitative Data Tables.

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

Does not include funding from H-1B Nonimmigrant Petitioner Fees.

<sup>1</sup> Includes Education System Reform as of FY 2004.

<sup>2</sup> Experimental Program to Stimulate Competitive Research.

<sup>3</sup> The FY 2005 request proposes to move funding for the partnerships from E.H.R. to Integrative Activities in R&RA at a request of \$80 million.

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

**Please see Chapter 7 for information on the NSF budget.**