

## NSF Research Flat Again in 2006, Education Programs Face Steep Cuts

### AAAS R&D Funding Update on NSF in the FY 2006 Budget

(This analysis is a preview of the NSF chapter in the forthcoming *AAAS Report XXX: Research and Development FY 2006*, a comprehensive look at the President's budget for R&D in FY 2006. This analysis contains revised AAAS estimates of NSF R&D, different from figures presented in the AAAS Preliminary Analysis of February 10. More tables and continually updated supplemental materials on R&D in the FY 2006 budget can be found on the AAAS R&D Web site at <http://www.aaas.org/spp/rd>.)

#### Highlights

- The National Science Foundation (NSF) budget, after declining in 2005, would receive a modest increase of 2.4 percent to \$5.6 billion, far short of the \$8.5 billion authorized by law.
- NSF R&D would increase 2.8 percent to \$4.2 billion (see Table II-7), but most of the increase would go to R&D facilities construction, leaving just a 1.2 percent increase for NSF support of research.
- **Most NSF research directorates would receive increases of about 1 percent in 2006, but the increases would still leave most research programs at or below 2004 funding levels** (see Table II-7).
- NSF's education and training programs would suffer steep cuts for the second year in a row, especially pre-college education programs.
- The Major Research Equipment and Facilities Construction (MREFC) account would enjoy a sizeable increase, going from \$174 million to \$250 million despite the lack of new starts.
- **The small increases for the research directorates would squeeze NSF funding of competitively awarded research grants.** The total number of research grants would increase to 6,310 in FY 2006, but would remain below 2004 numbers. Competition for grants would remain difficult: NSF expects to make awards to just one in five applications this year. Even successful applicants may be disappointed: the average size of an NSF research grant would fall in FY 2006 for the second year in a row.

#### Overview of the NSF Budget: Tough Times Continue

**The FY 2006 budget request of \$5.6 billion for NSF would be a \$132 million (or 2.4 percent) increase over this year's budget** (see Table II-7). But the FY 2005 budget signed into law in December contained a similarly-sized cut, leaving NSF with roughly the same budget in 2004 as in 2006.

An 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 2005 appropriation continued a recent trend of falling far short of the authorized level (see Figure 1). **The gap widens even further in the FY 2006 budget to \$2.9 billion, the distance between the \$5.6 billion request and the \$8.5 billion authorization, effectively killing the goal of a \$9.8 billion NSF budget by FY 2007.**

**NSF's R&D funding, which excludes education and training activities and overhead costs, would total \$4.2 billion, an increase of 2.8 percent or \$113 million after a cut in 2005** (see Table II-7). Most

of the increase would go to R&D facilities construction, leaving NSF support of research at \$3.7 billion, up just 1.2 percent and below the \$3.8 billion 2004 investment.

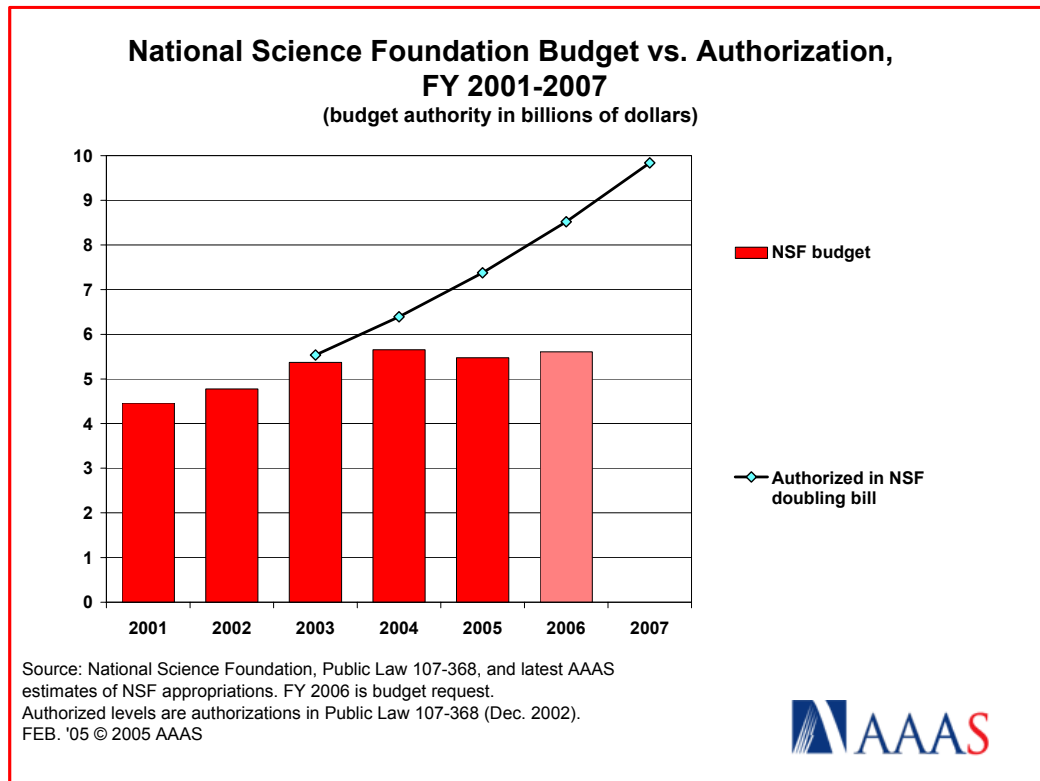


Figure 1. (click on the image for PDF)

The **Research and Related Activities (R&RA)** account, which funds most of NSF's R&D, would receive \$4.3 billion, 2.7 percent or \$113 million more than FY 2005. Much of the increase would be due to a proposed transfer of \$48 million in Coast Guard costs for icebreakers to the Office of Polar Programs. Subtracting this transfer, **most of the research directorates would receive increases of about 1 percent**, with only the Engineering (ENG) directorate proposed for an increase greater than inflation at 3.5 percent. Coming after budget cuts in 2005, **the 2006 budget would leave most NSF research programs at or below 2004 funding levels.**

The Integrative Activities (IA) account within R&RA would increase by \$5 million to \$135 million. Within the IA account, funding for the Major Research Instrumentation (MRI) program would stay at \$90 million in FY 2006 after falling from \$110 million in 2004. The MRI program awards competitive grants to universities and colleges to purchase laboratory equipment and instrumentation; in response to congressional concerns, at least \$20 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 \$23 million next year compared to \$20 million this year.

**NSF participation in the National Nanotechnology Initiative would increase modestly by 1.8 percent to \$344 million** across the directorates, with major funding for this initiative split between Engineering (ENG) and Mathematics and Physical Sciences (MPS). Overall NSF participation in another multi-agency initiative, Networking and Information Technology R&D (NITRD), would barely increase to \$803 million, up 1.0 percent. Most of NSF's contribution to the seven-agency NITRD investment would take place in the Computer and Information Science and Engineering (CISE) directorate, proposed for only a 1.1 percent gain to \$621 million.

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NSF's **Education and Human Resources** (EHR) programs would receive \$737 million, down a dramatic \$104 million from this year after an identical cut in the 2005 budget. Hardest hit in FY 2006 would be Elementary, Secondary and Information Education programs at a proposed \$141 million, down 23 percent from this year after a similar cut in the 2005 budget. NSF's Undergraduate Education programs would also fall, by 12 percent to \$132 million after another cut in 2005. There would also be a proposed cut of \$19 million from NSF's contribution to the **Math and Science Partnerships** (MSP) program. 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 2006 budget requests \$269 million for the Department of Education's (ED) share of the program, up dramatically from \$179 million this year. Combined, the MSP programs would receive \$329 million in FY 2006, up 27.5 percent from \$258 million this year, and would reflect the Bush Administration's desire to shift the emphasis of the program toward ED. The FY 2006 budget contains \$94 million for the Experimental Program to Stimulate Competitive Research (EPSCoR), the same as 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 be 21 percent** in FY 2006, essentially unchanged from 2005 and 2004. Among some directorates, the odds of success would be even lower. ENG expects to fund only 18 percent of its research grant applications, while CISE would fund 16 percent; both directorates' success rates would be up from just 15 percent last year and 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. The average grant would stay at 3.0 years in 2006, 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 0.2 percent average cut for NSF research grants between FY 2005 and FY 2006 to \$136,800 would follow a similar cut in 2005, and would leave nearly all NSF research directorates with the same average research grant size from 2004 through 2006 with no allowance for inflation.**

**NSF would expand its support of R&D facilities to \$429 million in FY 2006, an increase of 18.5 percent.** There would be \$250 million for the **Major Research Equipment and Facilities Construction** (MREFC) account, up a dramatic 44 percent from \$174 million this year. Although there are no proposed new starts in FY 2006, there would be dramatic increases for two FY 2005 starts. The Scientific Ocean Drilling Vessel project would receive \$58 million, up from \$15 million; the Rare Symmetry Violating Processes (RSVP) project would receive \$42 million, up from \$15 million. The other three projects in MREFC (the Atacama Large Millimeter Array, EarthScope, and the IceCube Neutrino Observatory) would continue at this year's levels in FY 2006. Two more projects (Ocean Observatories Initiative and the Alaska Region Research Vessel) were proposed for FY 2006 starts in last year's budget plan, but are now queued up for FY 2007 starts. The National Ecological Observatory Network (NEON) has been in past requests but has yet to be funded by Congress; in this request, NSF has pushed NEON funding back to FY 2007. The MREFC appropriation only pays for the construction of major R&D facilities; the \$429 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 \$114 million for the Partnership for Advanced Computational Infrastructure (PACI) to create and operate a national cyberinfrastructure of state-of-the-art computing, communications, and information resources for research and education.

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## 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 2, 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.

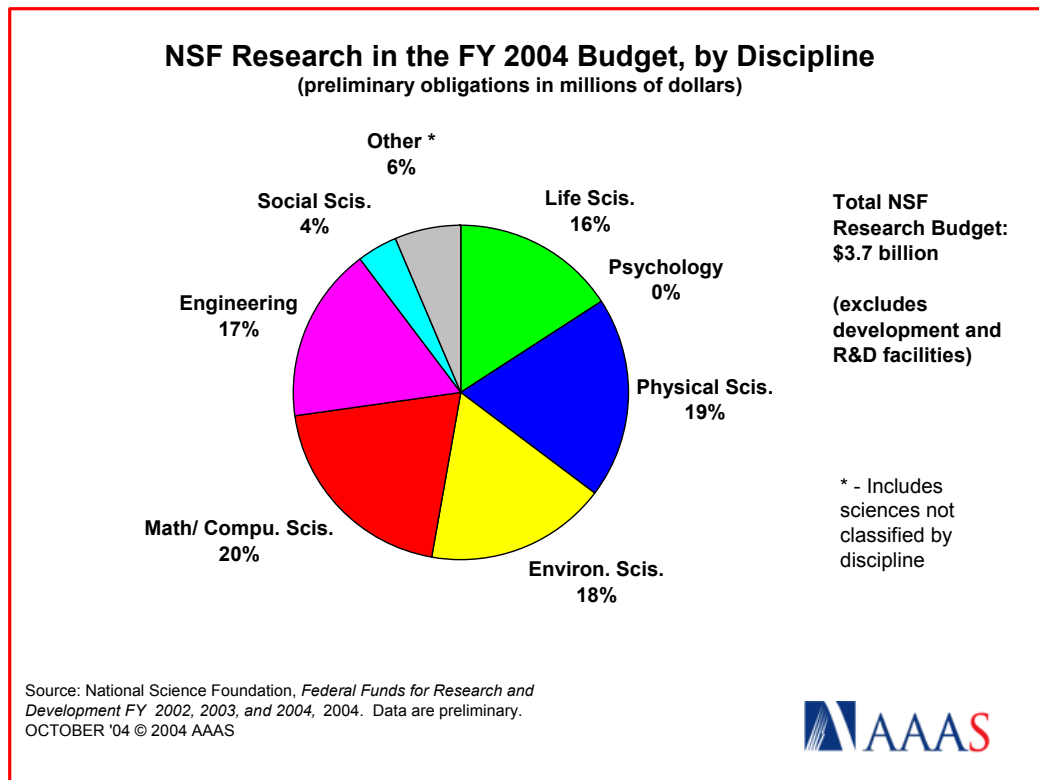


Figure 2. (click on the image for PDF)

The evenly distributed FY 2006 increase, however small, should benefit NSF support for most science and engineering disciplines after evenly distributed cuts in FY 2005. 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. 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 and 2006 budgets, falling short of inflation, would lead to an erosion of NSF support for most research disciplines back down to levels last seen in the last decade.

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 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 3. 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 budget over five years, culminating in the NSF authorization bill of December 2002. But budget growth slowed down to just ahead of the inflation rate in FY 2004, and

reverses with the FY 2005 budget's cuts. The FY 2006 request would keep NSF R&D just ahead of inflation, but only because of R&D facilities investments. As noted earlier, these smaller increases or cuts in recent years have 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 2006, with overall domestic spending proposed to decline, the restraints will be even tighter. In 2005, tight competition for scarce resources led Congress to go below the agency's request (see Figure 3), a scenario that already seems likely in the FY 2006 appropriations process.

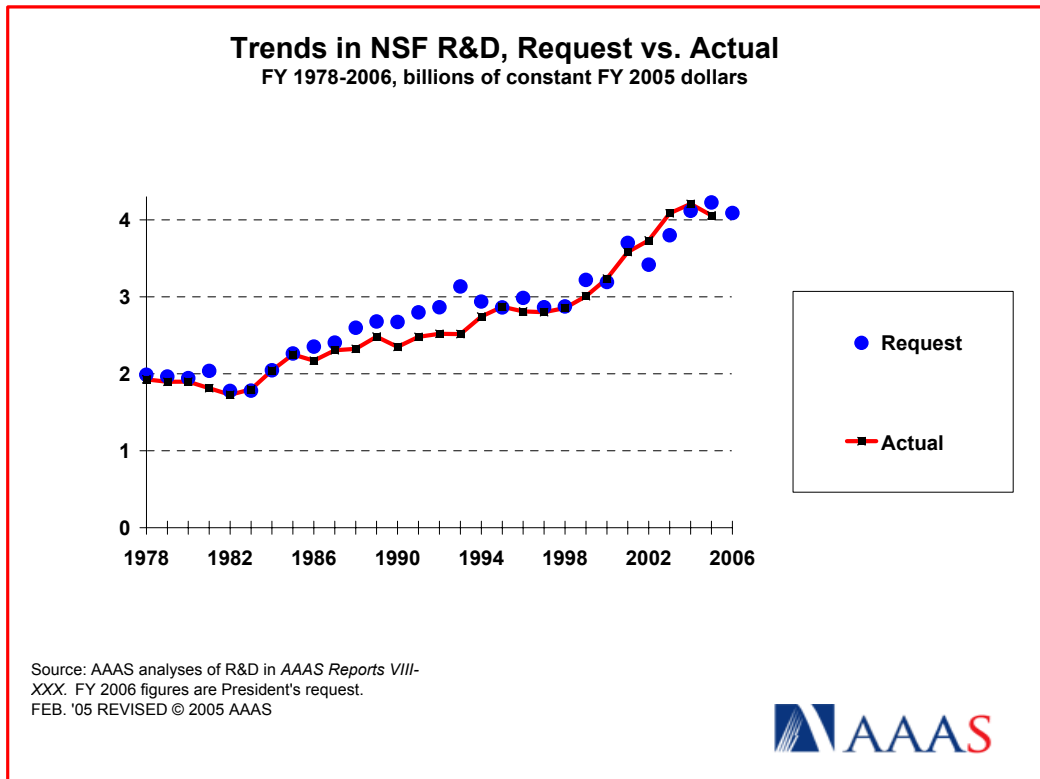


Figure 3. (click on the image for PDF)

- February 28, 2005

(More materials on R&D in the FY 2006 budget, historical data and charts, and more information on AAAS Report XXX: *Research and Development FY 2006*, can be found on the AAAS R&D Web site at <http://www.aaas.org/spp/rd>.)

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&amp;D

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

	FY 2004 Actual	FY 2005 Estimate	FY 2006 Budget	Change FY 05-06	
				Amount	Percent
1. Research and Related Activities (R&RA)					
Mathematical and Physical Sciences (MPS)					
Astronomical Sciences	197	195	<b>199</b>	4	1.8%
Chemistry	185	179	<b>181</b>	2	1.1%
Materials Research	251	241	<b>246</b>	5	2.2%
Mathematical Sciences	200	200	<b>200</b>	0	0.0%
Physics	228	225	<b>230</b>	5	2.3%
Multidisciplinary Activities	31	29	<b>30</b>	1	1.7%
Total MPS	1,092	1,070	<b>1,086</b>	16	1.5%
Engineering (ENG)					
Bioengineering & Env. Sys.	51	48	<b>51</b>	2	5.1%
Chemical & Transport System	69	66	<b>69</b>	3	4.9%
Civil & Mechanical Systems	67	82	<b>84</b>	2	2.7%
Design and Manuf. Innovation	66	64	<b>67</b>	4	5.6%
Electrical & Commun. Sys.	75	72	<b>74</b>	3	3.8%
Engineering Edu. & Centers	134	127	<b>130</b>	3	2.1%
Office of Industrial Innovation	104	103	<b>105</b>	3	2.5%
Total ENG	566	561	<b>581</b>	19	3.5%
Biological Sciences (BIO)					
Molecular and Cellular Bioscis	121	118	<b>110</b>	-8	-7.1%
Integrative Organismal Biology	107	104	<b>102</b>	-2	-1.7%
Environmental Biology	108	106	<b>107</b>	1	1.1%
Biological Infrastructure	81	81	<b>83</b>	2	2.9%
Emerging Frontiers	80	74	<b>86</b>	12	16.0%
Plant Genome Research	89	94	<b>94</b>	0	0.0%
Total BIO	587	577	<b>582</b>	5	0.9%
Geosciences (GEO)					
Atmospheric Sciences	238	233	<b>240</b>	6	2.7%
Earth Sciences	152	149	<b>154</b>	5	3.4%
Ocean Sciences	323	312	<b>315</b>	3	1.1%
Total GEO	713	694	<b>709</b>	15	2.2%
Computer and Information Science and Engineering (CISE)					
Computing & Commun. Foun.	80	91	<b>103</b>	11	12.2%
Computer & Network Sys.	115	132	<b>143</b>	11	8.0%
Information & Intelligent Systems	80	93	<b>105</b>	12	13.1%

(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 2004	FY 2005	FY 2006	Change FY 05-06	
	Actual	Estimate	Budget	Amount	Percent
Shared Cyberinfrastructure	112	124	<b>125</b>	1	1.1%
Information Tech. Research	218	174	<b>145</b>	-28	-16.3%
Total CISE	605	614	<b>621</b>	7	1.1%
Social, Behavioral, and Economic Sciences (SBE)					
Social & Economic Scis.	86	92	<b>93</b>	1	0.9%
Behavioral & Cognitive Scis.	71	79	<b>80</b>	1	1.1%
Science Resources Statistics	26	26	<b>26</b>	0	0.8%
Total SBE	184	197	<b>199</b>	2	1.0%
Office of International Sci & Eng	41	34	<b>35</b>	1	2.3%
US Polar Programs					
Polar Research Programs 1/ Antarctic Logistical Support	274	277	<b>319</b>	43	15.4%
	68	68	<b>68</b>	0	0.0%
Total Polar Programs	342	344	<b>387</b>	43	12.4%
Integrative Activities	164	130	<b>135</b>	5	3.8%
BA Adjustment *	-17	0	<b>0</b>	0	--
<b>Total R&amp;RA *</b>	<b>4,277</b>	<b>4,221</b>	<b>4,333</b>	113	2.7%
2. Major Research Equipment & Facilities Construction	156	174	<b>250</b>	76	44.0%
3. Education & Human Resources (EHR)					
Math & Science Partnerships	139	79	<b>60</b>	-19	-24.4%
EPSCoR 2/	94	94	<b>94</b>	0	0.3%
Elemen., Secondary & Informal	206	182	<b>141</b>	-41	-22.6%
Undergraduate Education	163	154	<b>135</b>	-19	-12.1%
Graduate Education	155	155	<b>155</b>	0	0.2%
Human Resource Development	120	119	<b>118</b>	0	-0.1%
Res., Eval.. And Commun.	66	60	<b>34</b>	-26	-43.2%
BA Adjustment *	0	0	<b>0</b>	0	--
Total EHR	945	841	<b>737</b>	-104	-12.4%

(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 2004	FY 2005	FY 2006	Change FY 05-06	
	Actual	Estimate	Budget	Amount	Percent
4. Salaries and Expenses	220	223	<b>269</b>	46	20.5%
5. National Science Board	4	4	<b>4</b>	0	0.8%
6. Inspector General	10	10	<b>12</b>	1	14.7%
Total NSF Budget *	5,611	5,473	<b>5,605</b>	132	2.4%
<b>Deduct non-R&amp;D Activities:</b>					
<i>R&amp;RA non-R&amp;D</i>	-462	-477	<b>-529</b>	52	10.8%
<i>EHR non-R&amp;D</i>	-792	-701	<b>-622</b>	-79	-11.3%
<i>Salaries and Expenses</i>	-220	-223	<b>-269</b>	46	20.5%
<i>National Science Board</i>	-4	-4	<b>-4</b>	0	0.8%
<i>Inspector General</i>	-10	-10	<b>-12</b>	1	14.7%
<b>Total NSF R&amp;D</b>	4,123	4,057	<b>4,170</b>	113	2.8%
Conduct of R&D	3,780	3,695	<b>3,741</b>	46	1.2%
R&D Facilities	343	362	<b>429</b>	67	18.5%

Source: NSF budget justification and Quantitative Data Tables.

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

1/ FY 2006 includes \$48 million proposed transfer from Coast Guard for icebreakers.

2/ Experimental Program to Stimulate Competitive Research.

**REVISED Feb. 17, 2005**

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

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