

## Federal Budget Authority for R&D Declined in FYs 2011 and 2012; Modest Increase Proposed for FY 2013

by Mark Boroush<sup>1</sup>

**F**ederal budget authority for research and development and R&D plant together totaled \$140.6 billion (current dollars) in FY 2012 (table 1). This is somewhat lower than the R&D and R&D plant total of \$144.4 billion in FY 2011—and even further below the \$149.0 billion enacted for FY 2010. Most of the overall drop in funding in these years resulted from reduced budget authority for defense-related R&D (figure 1).

For FY 2013, the total budget authority for R&D and R&D plant proposed by the President would rise somewhat to \$142.2 billion. This proposal contains a still further decrease in defense-related R&D, but there are increases in nondefense mission areas, such as space, energy, health, and commerce. (All amounts and calculations are in current dollars, unless otherwise noted.)

### Recent Trends in Budget Authority

#### *Total of R&D and R&D Plant*

Federal budget authority for the total of R&D and R&D plant increased each year over FYs 2006–10, with annual growth averaging 2.3% (table 1). When

adjusted for inflation, the yearly rate of growth over this period averaged 0.4%, just over the U.S. economy's general pace of price increases. The budget authority level for FY 2009 (\$164.3 billion) was a notable high-water mark, where the \$145.6 billion for R&D and R&D plant resulting from the normal congressional appropriation process that year was buoyed upward even further by a one-time \$18.7 billion increase through the American Recovery and Reinvestment Act of 2009.

A lower overall level of funding for R&D activities, however, has occurred since FY 2010. The budget authority total of \$144.4 billion for R&D and R&D plant in FY 2011 declined by \$4.6 billion (3.1%) from the FY 2010 level. The FY 2012 level of \$140.6 billion declined an additional \$3.8 billion (2.6%). When adjusted for inflation, these budget authority declines in FY 2011 and FY 2012 are even more substantial (table 1).

The FY 2011 budget for the federal government was not enacted in final form until 15 April 2011 (well after the 1 October 2010 start of FY 2011), and it resulted in some \$38.5 billion

in reductions to the FY 2010 spending levels throughout the government, including the aforementioned drop in federal budget authority for R&D and R&D plant. The FY 2012 budget was enacted through several spending bills in November and December 2011 and under the influence of the Budget Control Act of 2011, which was passed in August 2011 to address the national debt-ceiling crisis at the time and also mandated various budget cuts throughout the 10 years beginning with FY 2012. The enacted FY 2012 budget reduced federal spending an additional \$67 billion from the FY 2011 level.

The President's proposed budget authority for R&D and R&D plant in FY 2013 is \$142.2 billion, a \$1.7 billion increase (1.2%) over the FY 2012 level. This increase is the net of a still further decline in funding (\$1.5 billion) for defense R&D and R&D plant but an increase (\$3.1 billion) in a number of nondefense budget functions. Congressional consideration of this proposal continues as this report is released.

One key dimension of uncertainty in what level of federal support for R&D is eventually enacted by the Congress

TABLE 1. Federal budget authority for R&amp;D and R&amp;D plant, by budget function: FYs 2006–13

Nondefense												
Fiscal year	All functions	National defense (050)	Total	General science, basic research (251)	Space flight, research, supporting activities (252)	Energy (270)	Natural resources, environment (300)	Agri-culture (350)	Trans- portation (400)	Health (550)	Veterans benefits, services (700)	Other <sup>a</sup>
Current \$millions												
2006 actual	136,019	78,737	57,282	7,539	10,401	1,244	2,219	2,118	1,730	28,932	769	2,330
2007 actual	141,890	82,658	59,232	8,712	10,988	1,922	2,096	1,950	1,380	29,581	820	1,783
2008 actual	144,391	85,129	59,262	9,007	10,672	2,076	2,202	1,997	1,413	29,212	886	1,797
2009 total	164,292	85,642	78,650	14,128	9,060	3,794	2,615	2,249	1,461	42,051	943	2,349
Actual	145,553	85,342	60,211	9,941	8,374	2,234	2,371	2,073	1,357	30,989	943	1,929
ARRA	18,739	300	18,439	4,187	686	1,560	244	176	104	11,062	0	420
2010 actual	148,962	86,789	62,173	10,509	8,232	2,570	2,430	2,206	1,517	31,693	1,034	1,982
2011 actual	144,379	83,226	61,153	10,581	8,658	2,265	2,314	1,768	1,420	30,990	1,160	1,997
2012 preliminary	140,568	78,778	61,790	10,610	8,924	2,398	2,291	1,957	1,446	31,188	1,164	1,812
2013 proposed	142,235	77,296	64,939	10,440	9,134	2,734	2,431	1,961	1,593	31,480	1,166	4,000
Average annual growth,												
2006–10 <sup>b</sup> (%)	2.3	2.5	2.1	8.7	-5.7	19.9	2.3	1.0	-3.2	2.3	7.7	-4.0
% change 2010–11	-3.1	-4.1	-1.6	0.7	5.2	-11.9	-4.8	-19.9	-6.4	-2.2	12.2	0.8
% change 2011–12	-2.6	-5.3	1.0	0.3	3.1	5.9	-1.0	10.7	1.8	0.6	0.3	-9.3
% change 2012–13	1.2	-1.9	5.1	-1.6	2.4	14.0	6.1	0.2	10.2	0.9	0.2	120.8
FY 2005 constant \$millions												
2006 actual	131,546	76,148	55,398	7,291	10,059	1,203	2,146	2,048	1,673	27,981	744	2,253
2007 actual	133,280	77,642	55,638	8,183	10,321	1,805	1,969	1,832	1,296	27,786	770	1,675
2008 actual	132,554	78,150	54,404	8,269	9,797	1,906	2,021	1,833	1,297	26,817	813	1,650
2009 total	148,681	77,504	71,176	12,786	8,199	3,433	2,367	2,035	1,322	38,055	853	2,126
Actual	131,722	77,233	54,490	8,996	7,578	2,022	2,146	1,876	1,228	28,044	853	1,746
ARRA	16,958	271	16,687	3,789	621	1,412	221	159	94	10,011	0	380
2010 actual	133,574	77,824	55,751	9,423	7,382	2,305	2,179	1,978	1,360	28,419	927	1,777
2011 actual	126,960	73,185	53,775	9,304	7,613	1,992	2,035	1,555	1,249	27,251	1,020	1,756
2012 preliminary	121,368	68,018	53,350	9,161	7,705	2,070	1,978	1,690	1,248	26,928	1,005	1,564
2013 proposed	120,804	65,650	55,155	8,867	7,758	2,322	2,065	1,666	1,353	26,737	990	3,397
Average annual growth,												
2006–10 <sup>b</sup> (%)	0.4	0.5	0.2	6.6	-7.4	17.7	0.4	-0.9	-5.0	0.4	5.7	-5.8
% change 2010–11	-5.0	-6.0	-3.5	-1.3	3.1	-13.6	-6.6	-21.4	-8.2	-4.1	10.0	-1.2
% change 2011–12	-4.4	-7.1	-0.8	-1.5	1.2	3.9	-2.8	8.7	-0.1	-1.2	-1.5	-10.9
% change 2012–13	-0.5	-3.5	3.4	-3.2	0.7	12.2	4.4	-1.4	8.4	-0.7	-1.5	117.2

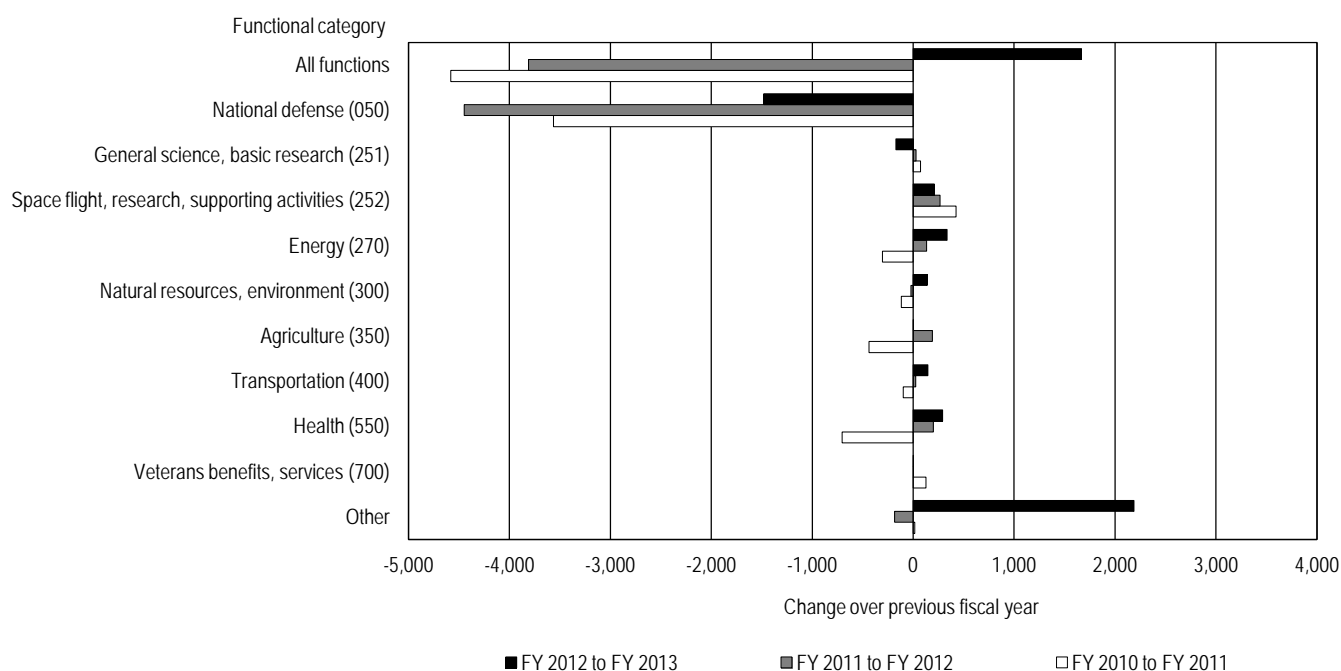
ARRA = American Recovery and Reinvestment Act of 2009.

<sup>a</sup> Includes International affairs (150), Commerce and housing credit (300), Community and regional development (450), Education, training, employment, and social services (500), Medicare (570), Income security (600), and Administration of justice (750).<sup>b</sup> Calculated as compound average annual growth rate over FYs 2006–10.

NOTES: Data show budget information collected through July 2012. Data for FYs 2006–11 are final appropriations.

SOURCES: Agencies' submissions to the Office of Management and Budget per MAX Schedule C, agencies' budget justification documents, and supplemental data obtained from agencies' budget offices.

FIGURE 1. Federal budget authority for R&D and R&D plant, change over previous fiscal year: FYs 2010–13  
(Millions of current dollars)



NOTE: "Other" includes International affairs (150), Commerce and housing credit (300), Community and regional development (450), Education, training, employment, and social services (500), Medicare (570), Income security (600), and Administration of justice (750).

SOURCES: Agencies' submissions to Office of Management and Budget per MAX Schedule C, agencies' budget justification documents, and supplemental data obtained from agencies' budget offices.

for FY 2013 arises from the funding sequestration provisions in the Budget Control Act of 2011. Depending on the budgetary agreements reached by the Congress (in early 2013), sizable changes could result in the R&D funding levels over those proposed by the President for FY 2013 and years beyond.

### R&D Plant

R&D plant is an important part of R&D activity, even if R&D is by far the more sizable component in this funding picture. The \$140.6 billion federal budget authority total for R&D activity in FY 2012 consisted of \$138.1 billion for R&D and \$2.4 billion for R&D plant (table 2). The corresponding levels in FY 2011 were \$142.5 billion for R&D and \$1.9 billion for R&D

plant. The President's proposed levels for FY 2013 are \$139.6 billion for R&D and \$2.7 billion for R&D plant. Over the past several years, by far the largest category of federal funding for R&D plant has been the General science and basic research function (table 2).

### Distribution of Funding by Budget Function

National defense continues to account for more than half (56%) of the annual federal budget authority for the total of R&D and R&D plant: \$78.8 billion in FY 2012 (table 1, table 3). The balance of funding (\$61.8 billion) is spread among 15 nondefense budget functions. Health is the largest of these, at \$31.2 billion in FY 2012—less than National defense, but still large. General science and basic research as well as Space

flight, research, and supporting activities are also sizable (\$10.6 billion and \$8.9 billion, respectively, in FY 2012). Energy, Natural resources and environment, Agriculture, Transportation, and Veteran's benefits and services each have budget authority in the range of one to several billion dollars annually. Budget authority for the seven other nondefense categories range from somewhat to well under \$1 billion annually: Commerce and housing credit; Education, training, employment, and social services; International affairs; Administration of justice; Income security; Community and regional development; and Medicare.

### National Defense

Budget authority for R&D and R&D plant directed at National defense

TABLE 2. Federal budget authority for R&amp;D and R&amp;D plant, by budget function and funding category: FYs 2006–13

(Millions of current dollars)

Fiscal years	Nondefense											
	All functions	National defense (050)	Total	General science, basic research (251)	Space research, technology, supporting activities (252)	Energy (270)	Natural resources, environment (300)	Agri-culture (350)	Trans- portation (400)	Health (550)	Veterans benefits, services (700)	Other <sup>a</sup>
	R&D											
2006 actual	131,624	78,037	53,587	6,691	8,204	1,195	2,120	1,869	1,711	28,797	769	2,231
2007 actual	138,087	82,272	55,815	7,809	9,024	1,893	1,936	1,857	1,361	29,461	820	1,654
2008 actual	140,113	84,713	55,400	8,234	8,323	1,896	2,106	1,864	1,394	29,063	886	1,634
2009 total	156,009	85,166	70,843	11,840	6,891	3,318	2,245	1,935	1,440	40,389	943	1,842
Actual	140,903	84,866	56,037	8,885	6,205	2,014	2,171	1,935	1,336	30,827	943	1,721
ARRA	15,106	300	14,806	2,955	686	1,304	74	0	104	9,562	0	121
2010 actual	146,596	86,517	60,079	9,547	8,232	2,455	2,237	2,043	1,496	31,488	1,034	1,547
2011 actual	142,457	82,972	59,485	9,483	8,398	2,233	2,171	1,916	1,395	30,903	1,160	1,826
2012 preliminary	138,146	78,471	59,675	9,372	8,642	2,367	2,137	1,875	1,421	31,024	1,164	1,673
2013 proposed	139,554	77,007	62,547	9,433	8,884	2,702	2,272	1,878	1,569	31,317	1,166	3,326
	R&D plant											
2006 actual	4,395	700	3,695	848	2,197	49	99	249	19	135	0	99
2007 actual	3,803	386	3,417	903	1,964	29	160	93	19	120	0	129
2008 actual	4,278	416	3,862	773	2,349	180	96	133	19	149	0	163
2009 total	8,283	476	7,807	2,288	2,169	476	370	314	21	1,662	0	507
Actual	4,650	476	4,174	1,056	2,169	220	200	138	21	162	0	208
ARRA	3,633	0	3,633	1,232	0	256	170	176	0	1,500	0	299
2010 actual	2,366	272	2,094	962	0	115	193	163	21	205	0	435
2011 actual <sup>b</sup>	1,922	254	1,668	1,098	260	32	143	-148	25	87	0	171
2012 preliminary	2,422	307	2,115	1,238	282	31	154	82	25	164	0	139
2013 proposed	2,681	289	2,392	1,007	250	32	159	83	24	163	0	674

ARRA = American Recovery and Reinvestment Act of 2009.

<sup>a</sup> Includes International affairs (150), Commerce and housing credit (370), Community and regional development (450), Education, training, employment, and social services (500), Medicare (570), Income security (600), and Administration of justice (750).<sup>b</sup> The Agricultural Research Service received \$82 million for R&D plant in FY 2011, but this was offset by \$230 million of rescissions in prior year R&D plant funding.

NOTES: Data show budget information collected through July 2012. Data for FYs 2006–11 are final appropriations.

SOURCES: Agencies' submissions to the Office of Management and Budget per MAX Schedule C, agencies' budget justification documents, and supplemental data obtained from agencies' budget offices.

objectives totaled \$83.2 billion in FY 2011 and \$78.8 billion in FY 2012, both well below the \$86.8 billion level in FY 2010 (table 1). The President's proposed funding level for FY 2013 is a further decrease to \$77.3 billion. National defense accounted for 56.0% of the R&D and R&D plant total in FY 2012, compared with 58.3% in FY 2010 and 57.6% in FY 2011 (table 3). The level proposed for FY 2013 would be lower still, at 54.3%.

Most of the R&D dollars in this functional category support military research, development, test, and evaluation (RDT&E) programs at the Department of Defense (\$71.9 billion of the \$78.8 billion category total in FY 2012). The Air Force and Navy have the largest engagements in this work, although the Army and several defense agencies (notably the Defense Advanced Research Projects Agency and the Missile Defense Agency) are also significantly involved.

R&D on atomic energy defense in the Department of Energy is a smaller but still sizable component of the defense category (\$4.3 billion in FY 2012). The two largest elements in this category are weapons activities (\$2.9 billion in FY 2012) and development of naval reactors (\$1.0 billion in FY 2012).

Most of the budget authority declines in the overall national defense category in FY 2011 and FY 2012 result from

TABLE 3. Distribution of total federal research and development and R&D plant budget authority, by budget function: FYs 2006–13  
(Percent)

2012		2006	2007	2008	2009		2010	2011	2012	2013
rank	Budget function	actual	actual	actual	Actual	ARRA	actual	actual	preliminary	proposed
	All functions conducting R&D	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1	National defense (050)	57.9	58.3	59.0	58.6	1.6	58.3	57.6	56.0	54.3
2	Health (550)	21.3	20.8	20.2	21.3	59.0	21.3	21.5	22.2	22.1
3	General science, basic research (251)	5.5	6.1	6.2	6.8	22.3	7.2	7.3	7.5	7.3
4	Space flight, research, supporting activities (252)	7.6	7.7	7.4	5.8	3.7	5.5	6.0	6.3	6.4
5	Natural resources, environment (300)	1.6	1.5	1.5	1.7	1.3	1.6	1.6	1.6	1.7
6	Energy (270)	0.9	1.4	1.4	1.5	8.3	1.7	1.6	1.7	1.9
7	Agriculture (350)	1.6	1.4	1.4	1.4	0.9	1.5	1.2	1.4	1.4
8	Transportation (400)	1.3	1.0	1.0	0.9	0.6	1.0	1.0	1.0	1.1
9	Veterans benefits, services (700)	0.6	0.6	0.6	0.7	0.0	0.7	0.8	0.8	0.8
10	Commerce, housing credit (370)	0.3	0.4	0.4	0.4	2.2	0.4	0.5	0.5	1.5
11	Education, training, employment, social services (500)	0.4	0.4	0.4	0.4	0.1	0.4	0.4	0.5	0.5
12	International affairs (150)	0.2	0.2	0.2	0.2	0.0	0.1	0.1	0.1	0.1
13	Administration of justice (750)	0.7	0.3	0.2	0.2	0.0	*	0.1	0.1	0.6
14	Medicare (570)	na	na	na	*	0.0	*	0.1	*	*
15	Community, regional development (450)	*	*	*	*	0.0	0.1	0.1	*	0.1
16	Income security (600)	*	*	*	*	0.0	0.1	*	*	*

\* = amount less than 0.05%. na = not applicable.

ARRA = American Recovery and Reinvestment Act of 2009.

NOTES: Detail may not add to total because of rounding. Percentage change calculated on unrounded data.

SOURCES: Agencies' submissions to Office of Management and Budget per MAX Schedule C, agencies' budget justification documents, and supplemental data obtained from agencies' budget offices.

reduced funding for RDT&E. This is also true for the proposed FY 2013 levels.

### Health

Budget authority for health R&D and R&D plant in FY 2012 was \$31.2 billion (22.2% of the total), marginally above the \$31.0 billion in FY 2011 but below the \$31.7 billion in FY 2010. Proposed funding in FY 2013 calls for a slight increase to \$31.5 billion.

The National Institutes of Health (NIH) is the predominant funder in this category, funding \$30.0 billion in FY 2012 and \$29.8 billion in FY 2011. The category also includes the R&D programs of the Consumer Product and Safety Commission, the Food and Drug Administration, the Occupational

Safety and Health Administration, and a number of Department of Health and Human Services agencies other than NIH (notably, the Agency for Healthcare Research and Quality and the Centers for Disease Control and Prevention).

### General Science and Basic Research

This category<sup>2</sup> includes R&D programs of the National Science Foundation (NSF), the Department of Energy's (DOE's) Office of Science, and up until FY 2013, some programs in the Department of Homeland Security. Budget authority for this category was \$10.6 billion in FY 2012 (7.5% of the total of R&D and R&D plant that year), only slightly higher than the levels in FY 2011 and FY 2010. The level

proposed for FY 2013 is a bit lower at \$10.4 billion. This category's funding has generally been increasing in recent years—in FY 2006 it was \$7.5 billion (table 1). In FY 2012, NSF funded \$5.6 billion, or somewhat over half of the category's budget authority total; DOE's Office of Science funded \$4.5 billion; and the Department of Homeland Security R&D program funded a much smaller amount, well under \$1 billion.

### Space Flight, Research, and Supporting Activities

Budget authority for R&D and R&D plant in this functional category was \$8.9 billion in FY 2012. The President's proposed level for FY 2013 is marginally higher at \$9.1 billion. National Aeronautics and Space Administration (NASA) programs account for the

entire amount. This category's share of the total has remained around 6% in the past several years. It was 7% or higher earlier in the 2000 decade.

### **Energy**

Budget authority for R&D and R&D plant in this functional category was \$2.4 billion in FY 2012, slightly above the \$2.3 billion in FY 2011. The President's proposed budget for FY 2013 calls for an increase to \$2.7 billion. The Department of Energy's various energy programs and the Advanced Research Projects Agency–Energy (ARPA-E) account for the vast majority of this category total (\$2.1 billion in FY 2012). The category also includes smaller R&D funding levels for the Nuclear Regulatory Commission, the Tennessee Valley Authority, and the Department of Agriculture's National Institute of Food and Agricultural Biomass R&D program.

### **Natural Resources and Environment**

This functional category includes R&D across a range of purposes: conservation and land management, pollution control and abatement, recreational resources, water resources, and other natural resources. Budget authority for the category as a whole was \$2.3 billion in FY 2012 and \$2.3 billion in FY 2011. The proposed level for FY 2013 is \$2.4 billion. Most of this funding is associated with R&D programs in the Department of Commerce (chiefly, the National Oceanic and Atmospheric Administration and the U.S. Geological Survey), the Environmental Protection Agency, and the Department of Agriculture (notably, the Forest Service). The category total also includes R&D activities in the Department of the Interior (including the Bureau of Reclamation and National Park Service), the Army Corps of Engineers, and the U.S. Coast Guard.

### **Agriculture**

Budget authority for R&D and R&D plant this category was \$2.0 billion in FY 2012, compared with \$1.8 billion in FY 2011. The proposed level for FY 2013 is also \$2.0 billion. This category is composed entirely of Department of Agriculture R&D programs.

### **Transportation**

Budget authority for R&D and R&D plant in this category includes \$1.4 billion in FY 2012, \$1.4 billion in FY 2011, and \$1.6 billion proposed for FY 2013. Most of the R&D in this category is directed at air transportation and ground transportation issues, but there is also some directed at water and other transportation areas. Most of the funding is for Department of Transportation agencies and NASA.

### **Veterans Benefits and Services**

A total of \$1.2 billion in FY 2012 and \$1.2 billion in FY 2011 were included in the budget authority for R&D and R&D plant in this functional category; \$1.2 billion was also proposed for FY 2013. The funding in this category is for R&D programs at the Department of Veterans Affairs (medical services and medical/prosthetic research).

### **Definitions**

*Budget authority* is the primary source of legal authorization for a federal agency to enter into obligations that will result in outlays.

*Budget functions* are categories defined by the Office of Management and Budget (OMB) into which all activities funded by the federal budget are classified. There are 20 such broad functional categories currently, most with a number of subfunctions. R&D activities are present in 15 of these broad functional categories. The 16 categories discussed in this report include 14 of

these broad categories plus one of the broad categories separated into its two subfunctions (see note 2 below). For a tally of the federal budget by function and subfunction see table 5-1 in the Historical Tables section of the President's *Budget of the United States Government, Fiscal Year 2013* (<http://www.whitehouse.gov/omb/budget/Historicals/>). For a further discussion of the recognition of R&D in these budget functions see the OMB's guidance in *Circular A-11*, MAX Schedule C, "Research and Development Activities" ([http://www.whitehouse.gov/sites/default/files/omb/assets/a11\\_current\\_year/s84.pdf](http://www.whitehouse.gov/sites/default/files/omb/assets/a11_current_year/s84.pdf)).

*Research and development* (R&D) refers to basic research, applied research, and development in the sciences and engineering.

*R&D plant* refers to the acquisition of, construction of, major repairs to, or alterations in structures, works, equipment, facilities, or land for use in R&D activities.

### **Data Sources and Availability**

The statistics described in this report account for nearly all federally sponsored R&D activities and are based chiefly on information federal agencies provide to OMB. The underlying data are tabulated for NSF by the American Association for the Advancement of Science and reflect federal budget information collected and analyzed through July 2012. The data up through FY 2011 are final appropriations. The statistics for FY 2012 draw mainly on the FY 2012 federal budget as enacted by the Congress (in November and December 2011), but in some places they use estimates of agency spending plans and, accordingly, are marked "preliminary." The figures for FY 2013 mainly reflect

the President's proposed Budget of the United States Government for FY 2013 (publicly released 13 February 2012) but also include subsequent executive branch and agency budget office information. Accordingly, the budget numbers for individual activities, programs, or agencies may differ from those published in the President's proposed budget or agency budget documents.

The full set of detailed tables on federal budget authority for R&D in FY 2011 and 2012, and the President's proposed levels for FY 2013 will be available in a companion statistical report, *Federal R&D Funding by*

*Budget Function: Fiscal Years 2011–13*, at <http://www.nsf.gov/statistics/fedbudget/>. Individual detailed tables may be available in advance of the full report. For further information, contact the author.

## Notes

1. Mark Boroush, Research and Development Statistics Program, National Center for Science and Engineering Statistics, National Science Foundation, 4201 Wilson Boulevard, Suite 965, Arlington, VA 22230 (mboroush@nsf.gov; 703-292-8726).

2. The Office of Management and Budget's broad category of General

science, space, and technology (250) divides into a pair of subfunctions: General science and basic research (251) and Space flight, research, and supporting activities (252). Given the intrinsic differences in these two R&D endeavors and the wide public interest in each, these subfunctions are discussed separately in this report. Furthermore, despite the title of the category General science and basic research, not all basic research funded by the federal government is classified in this single category. Federal funding for basic research arises in other functional categories, such as National defense or Health, and is included in the category funding totals there.



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