



FY 2017 R&D Appropriations So Far: A Roundup

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Congress has returned from the August recess with FY 2017 appropriations still unfinished and less than a month left in the fiscal year, but a long wait is likely before funding decisions are finalized. Here’s a brief look at appropriations so far for some of the major federal R&D agencies and programs.

Context and Progress

Coming into the current appropriations cycle, the President and Congress had limited fiscal room with which to work. Discretionary spending – the part of the

budget adjusted annually by appropriators, and the source of most federal science funding – was slated to be held flat at \$1.07 trillion, under the second and final year of the Bipartisan Budget Act. Accordingly, the President’s discretionary R&D budget, released in February, set rather modest goals for federal R&D in FY 2017. Some standard Obama Administration priorities like clean energy and climate were again prominent, but some agencies like the National Science Foundation (NSF) received only limited discretionary increases, while the National Institutes of Health (NIH) and NASA faced billion-dollar cuts. The Administration attempted to

R&D Funding in FY 2017 Appropriations (current AAAS estimates of budget authority in billions of nominal dollars)									
Appropriations Bill	2015	2016	2017 Pres.	2017 House	Percent Change		2017 Senate	Percent Change	
					Pres.	FY16		Pres.	FY16
DEFENSE¹	66.4	72.2	73.6	72.9	-0.8%	1.0%	73.5	-0.1%	1.8%
<i>DOD Science & Tech</i>	13.7	15.2	13.3	14.5	9.1%	-4.1%	15.1	13.3%	-0.4%
LABOR/HHS/EDUCATION²	30.4	32.2	31.3	33.6	7.4%	4.3%	34.3	9.8%	6.6%
<i>Includes NIH, Dept. of Education</i>									
COMMERCE/JUSTICE/SCIENCE²	19.0	21.4	20.3	21.0	3.7%	-1.6%	21.1	4.3%	-1.1%
<i>Includes NSF, NASA, NOAA, NIST</i>									
ENERGY AND WATER³	14.5	14.6	16.8	15.9	-5.6%	9.1%	16.0	-5.0%	9.8%
<i>Includes Dept. of Energy</i>									
AGRICULTURE²	2.6	2.8	2.7	2.7	-1.1%	-2.7%	2.7	-0.9%	-2.5%
<i>Includes USDA</i>									
INTERIOR AND ENVIRONMENT¹	2.0	2.0	2.1	2.1	-3.5%	0.9%	2.0	-5.8%	-1.6%
<i>Includes USGS, EPA, Forest Service</i>									
OTHER	3.5	3.1	3.3	3.2	-3.0%	3.5%	3.3	-0.4%	6.3%
TOTAL R&D	138.3	148.3	150.1	151.4	0.9%	2.1%	153.0	1.9%	3.2%
Defense Function⁴	72.7	78.0	80.8	80.2	-0.8%	2.8%	80.7	-0.2%	3.5%
Nondefense Functions	65.6	70.3	69.3	71.3	2.8%	1.3%	72.3	4.4%	2.8%

¹ Passed by Appropriations Committees in both chambers, and approved by full House.
² Passed by House and Senate Appropriations Committees.
³ Passed by Appropriations Committees in both chambers, and approved by full Senate.
⁴ Includes Dept. of Defense and NNSA.
 Excludes R&D funded through new mandatory proposals in FY 2017.
 FY 2016 figures are current estimates. Inflation from FY16-17 is 1.8 percent.

supplement this relatively unambitious discretionary budget by proposing an additional \$4.2 billion in mandatory funding for nondefense R&D, but Congress quickly rejected these collective mandatory proposals.

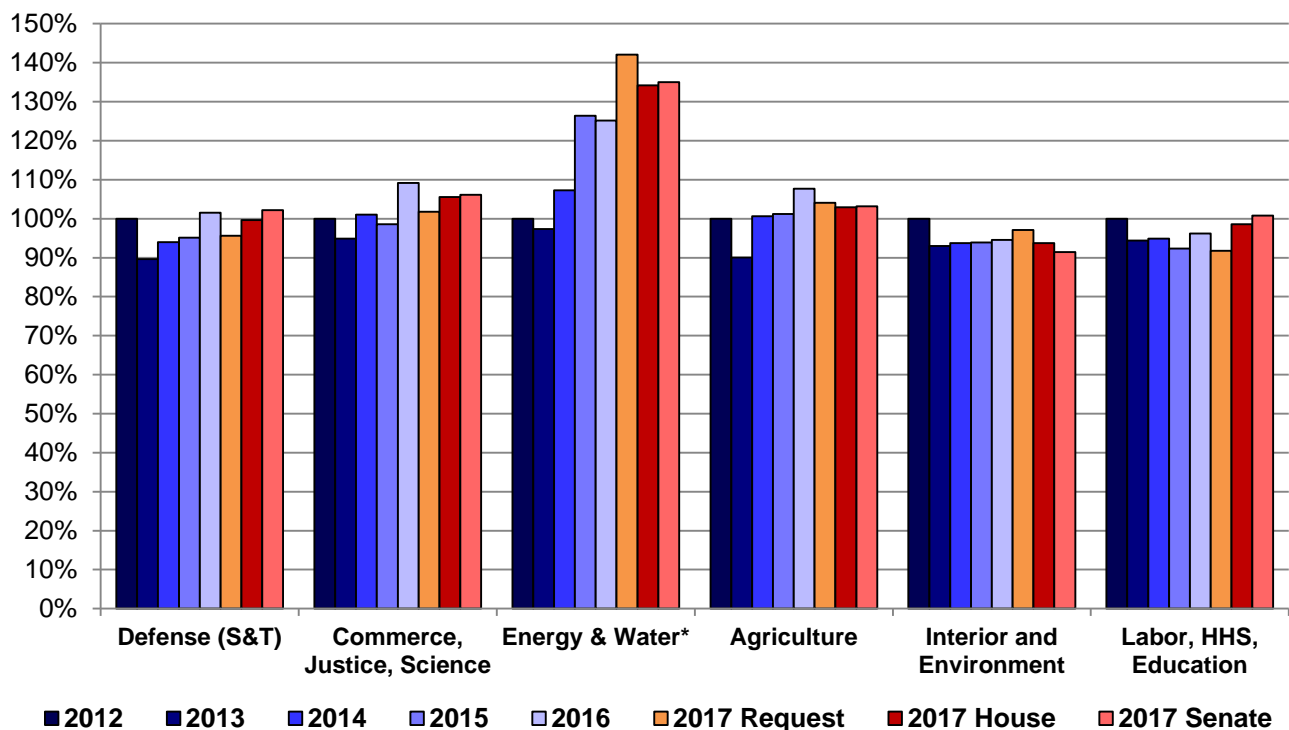
Within Congress, several lines of dispute have irretrievably disrupted the appropriations process. To start, intraparty Republican disagreement over spending levels emerged early on. Even though Congress has *already* agreed on a discretionary spending target for FY 2017 under the aforementioned budget deal, and with Republican leadership still supportive of that deal, legislators have been unable to produce a budget resolution, thanks to a vocal conservative minority led by the House Freedom Caucus that wants to see deeper cuts.¹ Legislators have also sparred over whether to use war funding to get around the current spending caps (see the Department of Defense section below). And progress over spending bills – including the Zika supplemental funding, the fate of which is still to be determined – has been marred by policy riders on a wide range of topics from both parties in both chambers.

As a result, while the appropriations committees in both chambers have each completed their work and approved all twelve necessary spending bills, only a handful of these bills have been approved on either chamber’s floor. At the time of this writing, Congressional passage of a continuing resolution to avoid a shutdown on October 1 is likely, though once again there have been disputes over the duration of such a measure. Odds would seem to favor an eventual omnibus spending package that cobbles together the remaining spending bills, perhaps in December, though time will tell.

For science and technology agencies, the current situation means yet another year of budget uncertainty under a several-week continuing resolution and an extended appropriations process. Even so, a fairly clear funding picture has emerged with the complete set of twelve appropriations bills already through committee, and appropriators’ decisions so far will factor into omnibus negotiations later. Below is a summary of where things stand for some of the largest agencies.

R&D Funding Estimates in the Six Largest R&D Spending Bills

Estimated funding as a percent of FY 2012, constant dollars



*The Department of Energy changed its R&D accounting for FY 2015-2017. Prior years are not comparable.

CJS bill includes NSF, NASA, Commerce. Labor, HHS, Education bill includes NIH.

Source: AAAS analyses of agency budget documents and appropriations bills and reports. R&D includes conduct of R&D and R&D facilities. FY 2017 Request figures refer to base budget only, excluding new mandatory spending. © 2016 AAAS

¹ See <http://www.politico.com/story/2016/03/house-freedom-caucus-to-break-with-leadership-on-budget-220758>

Research and Development Funding

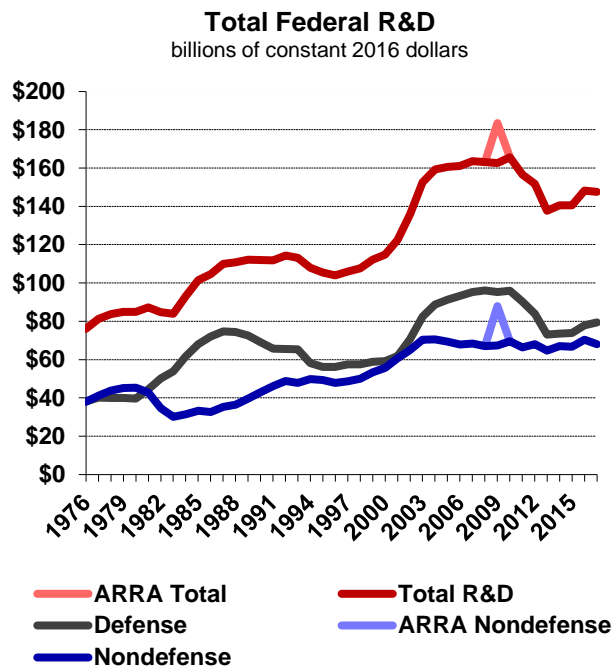
According to the latest AAAS estimates, both the House and Senate would provide moderate increases to federal R&D overall in FY 2017: the House would provide a \$3.1 billion or 2.1 percent increase for R&D above FY 2016 levels, while the Senate would provide a \$4.7 billion or 3.2 percent increase (see table). Both amounts would represent real-dollar increases given a rate of inflation of 1.8 percent. Both chambers have also been somewhat more generous than the President overall.

There are three primary drivers of these moderate increases in both chambers. First, there were modest funding increases for the R&D accounts within the Department of Defense (DOD), which add up to a nearly billion-dollar increase in the House and a \$1.5 billion increase in the Senate. Second, NIH has stood out as a significant recipient of Congressional largesse: the health research agency has received a \$1 billion increase in the House and a \$2 billion increase in the Senate. Third, both chambers provided an apparently large funding increase for R&D activities at the National Nuclear Security Administration (NNSA). However, it should be noted that this increase does not actually reflect changes in the underlying appropriations accounts, which are much more modest, and instead appears to be due in part to accounting factors in the budget request (see the Department of Energy section below for actual

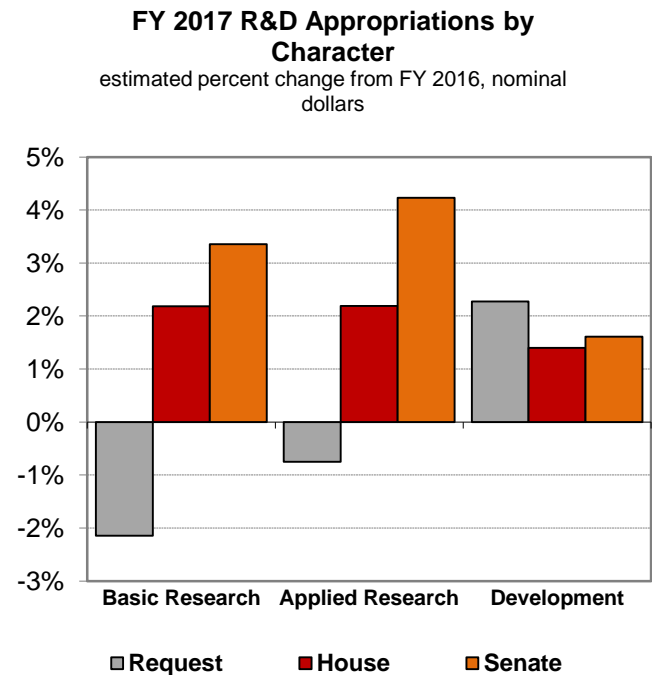
appropriations figures for NNSA).

In years past, Congress would at times exhibit a mild preference for defense R&D (which includes DOD and NNSA) over nondefense R&D (which includes everything else science-related). Such a preference is somewhat harder to see this year. While the latest estimates do show defense R&D with a relatively larger gain, as seen in the overview table, this is mostly due to the “artificial” NNSA R&D increase mentioned above, while DOD, the bigger driver of defense-related R&D, would receive a more modest increase in line with nondefense R&D. At the same time, the rise in nondefense R&D is due entirely to the NIH increase, in a year when most other science and technology programs have seen only minimal funding changes from the prior year.

Also noteworthy is the distribution of funding between research and development. Because the President’s base budget had sought billion-dollar cuts to NIH and NASA, as well as a deep cut to DOD basic research, it tallied up to a more than two percent reduction to basic research funding, and a smaller cut to applied research. Because Congress has resoundingly turned down the NIH and NASA cuts, and partially turned down the DOD research cuts, both House and Senate appropriations so far add up to at least two percent increases for both basic and applied research.

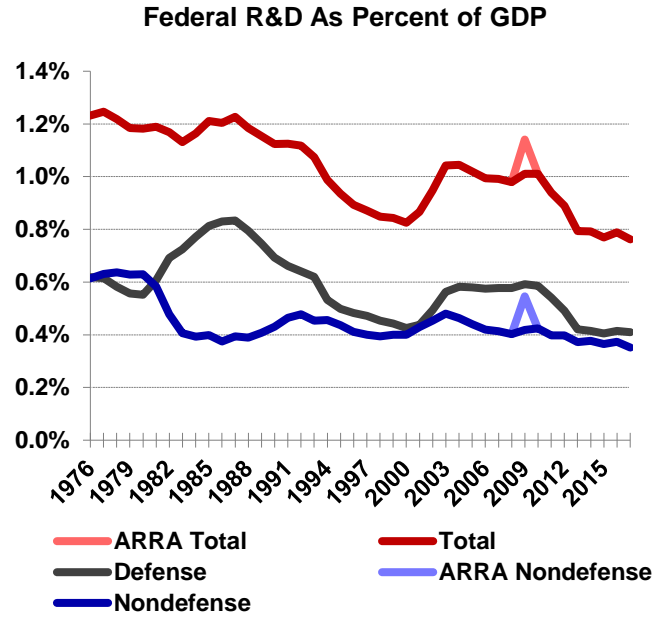


Source: Up to 1994: NSF, Federal Funds for R&D. 1995 to Present: AAAS analysis of agency budget data. © 2016 AAAS



President’s request excludes mandatory proposals. Inflation is 1.8 percent. © 2016 AAAS

Lastly, with the moderate bicameral increases discussed, federal R&D as a share of the U.S. economy would reach 0.78 percent under current House appropriations and 0.79 percent under Senate appropriations, both on par with recent years (see chart)



Source: Up to 1994: National Science Foundation, *Federal Funds for Research and Development*. 1995 to Present: AAAS analysis of agency budget data. © 2016 AAAS

Department of Defense

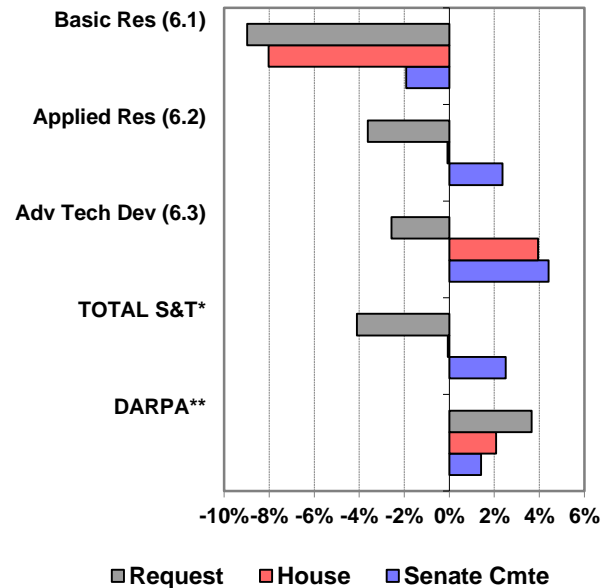
Spending Bill: Defense (H.R. 5293; S. 3000); **Latest Approvals:** House on June 16; Senate Appropriations Committee on May 26 (failed Senate on September 6)
Spending Bill: Military Construction and Veterans Affairs (H.R. 4974; S. 2806); **Latest Approvals:** House on May 19; Senate on May 19

The President’s February budget request for the Department of Defense (DOD) made waves due to a sizable \$535.8 million or 4.1 percent reduction to DOD’s collective research and advanced technology accounts, known together as the Science and Technology budget (S&T). Perhaps most controversial was another proposed cut – by 9.0 percent – to DOD basic research (known as the 6.1 account in the DOD nomenclature). This constrained funding may be owed in part to the so-called Third Offset Strategy, an attempt to enhance U.S. technological superiority via focused work on robotics, human-machine learning and collaboration, semi-autonomous systems, cyberwarfare, and other areas.² While all of these are undoubtedly high-tech, the strategy does not rely so much on funding from the S&T accounts, and instead draws from the latter-stage, nearer-term development accounts for R&D dollars (there are four of these in total, collected as “Tech Development” in the DOD table below).

Congressional appropriators have not generally seen eye-to-eye with the Pentagon on funding levels for the S&T

DOD S&T in FY17 Appropriations

percent change from FY16 levels, nominal dollars



*Total S&T combines 6.1, 6.2, and 6.3. **DARPA’s budget is composed of portions of the other accounts listed above. Inflation is 1.8 percent. ©2016 AAAS

accounts this year, with the House roughly flat-funding these collective accounts, and the Senate providing a 2.5 percent or \$327 million increase above FY 2016 levels, as shown in the below table. The clearest difference with the request across both chambers is seen with applied

Department of Defense R&D Appropriations (budget authority in billions of nominal dollars)									
Program / Account	2015	2016	2017 Pres.	2017 Percent Change			2017 Senate	2017 Percent Change	
				House	Pres.	FY16		Pres.	FY16
Science & Tech	12.0	13.0	12.5	13.0	4.2%	-0.1%	13.4	6.9%	2.5%
<i>Basic Res (6.1)</i>	2.2	2.3	2.1	2.1	1.0%	-8.0%	2.3	7.8%	-1.9%
<i>Applied Res (6.2)</i>	4.6	5.0	4.8	5.0	3.7%	-0.1%	5.1	6.2%	2.4%
<i>Adv Tech (6.3)</i>	5.2	5.7	5.6	6.0	6.7%	3.9%	6.0	7.2%	4.4%
Medical Research	1.7	2.1	0.8	1.5	82.4%	-29.2%	1.7	110.3%	-18.4%
Tech Development	52.1	56.9	59.3	57.8	-2.5%	1.5%	57.8	-2.5%	1.5%
Other*	1.0	0.8	0.8	0.8	-0.7%	-6.5%	0.8	0.3%	-5.5%
Budget Adjustment	-0.2	-0.7	0.4						
TOTAL R&D	66.5	72.2	73.7	73.1	-0.8%	1.2%	73.7	-0.1%	2.0%
Def Adv Res Proj Agency 1/	2,916	2,868	2,973	2,928	-1.5%	2.1%	2,909	-2.2%	1.4%

* R&D support in military personnel, construction, and other non-RDT&E programs.
 1/ Included in Total R&D. In millions of nominal dollars.
 FY 2016 figures are current estimates. Inflation from FY16-17 is 1.8 percent.
 Budget Adjustment converts total obligational authority to budget authority.
 Includes Overseas Contingency Operation funding.

² For more see <http://breakingdefense.com/2016/06/trust-robots-tech-industry-troops-carter-roper/>

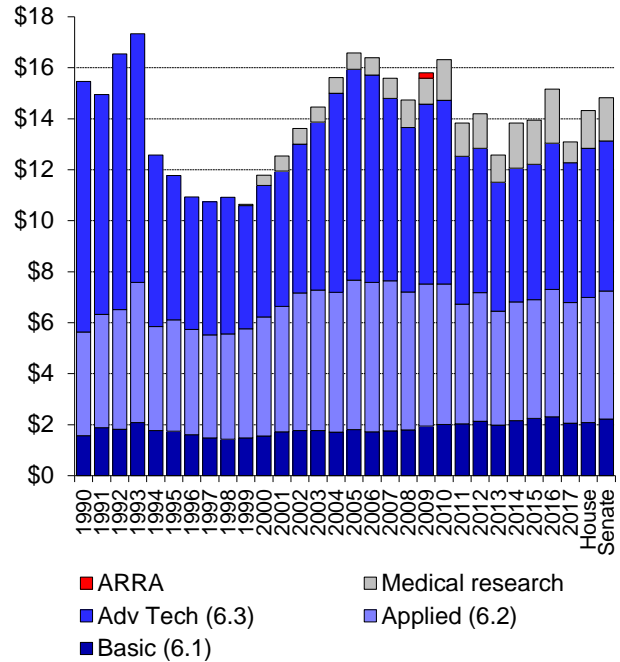
research (a.k.a. the 6.2 account) and advanced technology development (6.3; see graph). These variances with the Pentagon budget mean extra funding, if not always year-over-year increases, for a wide range of DOD program elements including materials science, electronics, munitions technology, aeronautics, and many other fields.

It's a different story with basic research, with House appropriators mostly adopting the 6.1 cuts, excepting \$22 million in extra funds for university initiatives and programs at minority-serving institutions. The Senate did reject most of the proposed cuts, but would still leave DOD basic research 1.9 percent below FY 2016 levels. Navy basic research programs – including intramural and university activities – would be particularly hard-hit, with reductions below FY 2016 levels of 16.2 percent in the Senate and 19.2 percent in the House.

Outside the military branches, the Defense Advanced Research Projects Agency (DARPA) appears set for an increase roughly equal to the rate of inflation, though somewhat less than the request. However, the House and Senate diverged on DOD's plans to better engage high-tech innovators via the Defense Innovation Unit-Experimental (DIUx), which has one office in Silicon Valley, a second in Boston,³ and plans for a third in Austin, TX.⁴ The Administration had requested \$30 million in applied research funds (and a reported \$45 million total) for DIUx; the Senate has given \$28 million out of \$30 million, while the House provided no funding.

Appropriators also appear to have locked in the requested 28 percent increase for the Science, Mathematics, and Research for Transformation (SMART) student scholarship program, which runs against the basic research funding current. Senate appropriators have granted a sizable increase above the request to the DOD program element that funds the Minerva Initiative and the National Security Science and Engineering Faculty Fellowship, leaving that element near FY 2016 levels; conversely, House appropriators have adopted the Pentagon request to nearly halve those activities. Appropriators have also granted the requested increases for advanced manufacturing programs administered through the Office of the Secretary of Defense. This will allow DOD to establish two new manufacturing innovation institutions while supporting six existing

DOD Science and Technology Funds
in billions of constant FY 2016 dollars



Source: DOD R-1, historical data, and appropriations. Note: Medical Research is appropriated outside RDT&E title. © 2016 AAAS

institutes; all are part of the President's National Network for Manufacturing Innovation (NNMI).

In a recurring debate, conflict emerged over whether Congress should redirect some war funding – dubbed Overseas Contingency Operations or OCO funding – to cover base-budget activities at DOD. In their bill, House appropriators provided DOD with \$58.6 billion in OCO funding as requested, but would shift about \$16 billion to non-OCO uses elsewhere at DOD, including \$163 million for RDT&E. The move would provide defense hawks a means of increasing defense spending without violating the caps reached in last fall's budget deal,⁵ since OCO dollars are exempt from those caps, but the shift means war funding would run out next April, requiring the next president and Congress to deal with the shortfall. The Senate version does not propose such a move, and President Obama has threatened to veto the House bill over the OCO provision.⁶ A similar debate cropped up during this year's National Defense Authorization Act consideration.

³ See <http://www.federaltimes.com/story/government/it/2016/07/27/carter-diux-boston-silicon-valley/87614862/>

⁴ See <http://www.bizjournals.com/austin/news/2016/09/14/defense-department-chooses-austin-for-tech.html>

⁵ See <http://www.aaas.org/news/two-year-budget-deal-means-room-rd-growth>

⁶ See: https://www.whitehouse.gov/sites/default/files/omb/legislative/sap/114/saphr5293r_20160614.pdf

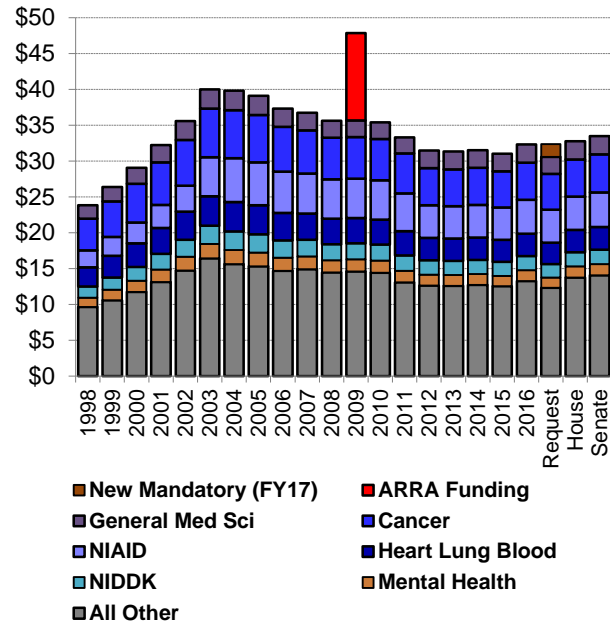
National Institutes of Health

Spending Bill: Labor, HHS, and Education (H.R. 5926; S. 3040); **Latest Approvals:** House Appropriations Committee on July 14; Senate Appropriations Committee on June 9

Controversially, the President’s budget request took an unusual approach to NIH funding in FY 2017. Like other agencies, the NIH budget relied on a mandatory spending package totaling \$1.8 billion to achieve a meaningful increase; but unlike other agencies (excepting NASA), this mandatory funding would have been used to offset a steep cut of \$1 billion or 3.1 percent to the discretionary budget. This base-budget cut would alone have forced reductions of a few percentage points for most individual institute budgets. The deepest reduction below FY 2016 funding was reserved for the National Institute on Aging (NIA), which would have seen a 20.8 percent reduction following a large \$400 million increase in Congressional appropriations last year, primarily for Alzheimer’s research. The President’s request also would have meant over 800 fewer competing research grants relative to FY 2016. Without the influx of new mandatory spending – a proposal that faced uncertain odds in February, and still does – such a base-budget reduction would have left the NIH budget approximately 23.6 percent below its inflation-adjusted peak in FY 2003, and largely erased the fiscal gains enjoyed by the agency via its strong FY 2016 appropriation.

Appropriators’ responsibility only extends to the NIH discretionary budget, and appropriators in both chambers have roundly rejected the proposed cuts there: the House Appropriations Committee instead achieved a \$1.3 billion or 3.9 percent increase, while their Senate counterparts achieved a \$2 billion or 6.2 percent increase (see table below). These figures would leave the aggregate NIH budget 18.1 percent and 16.3 percent, respectively, below the FY 2003 peak. They would also continue the recent recovery from sequestration-level spending: the House figure would represent a 4.6 percent increase above the sequestration year in FY 2013, while the Senate figure would represent a 7.0 percent increase, and would actually be roughly even to FY 2012 funding levels, the last year before sequestration kicked in. In addition, House appropriators included report language indicating expectations of a 20 percent success rate for grant applications and 11,175 new research project grants – both metrics well above the Administration’s request.

NIH Budget in Appropriations
Constant FY 2016 dollars in billions



Source: Agency budget data, appropriations, and the FY 2017 request. Adjusted for biomedical R&D inflation rate (BRDPI). Excludes supplemental FY 2017 Zika proposal and supplemental FY 2015 Ebola funding. © 2016 AAAS

Regarding priorities, the Administration’s request had a few key ones: the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative, slated for a \$45 million increase to \$195 million; the Precision Medicine Initiative (PMI), slated for \$100 million; and the new National Cancer Moonshot, slated for \$680 million. These priorities would have been fully funded through the proposed mandatory budget, and accounted for the entirety of NIH’s proposed increase in FY 2017. Appropriators have so far embraced two of these three initiatives within the discretionary budget itself. The PMI request was matched in both chambers. The BRAIN Initiative received its requested increase in the House, while the Senate added an additional \$55 million above the request. This latter figure would allow the BRAIN Initiative to reach \$250 million in total, a \$100 million or 66.7 percent increase above FY 2016. The outlier, so far, is the Cancer Moonshot, which did not receive most of its requested funding as appropriators waited for details on NIH’s strategy.⁷ Instead, appropriators in both chambers have opted to renew their support for Alzheimer’s research, granting major increases to NIA.

⁷ The initiative’s blue ribbon panel released its recommendations on September 7: <http://www.cancer.gov/research/key-initiatives/moonshot-cancer-initiative/blue-ribbon-panel>

In addition, the Senate committee also provided a \$50 million increase for NIH antimicrobial resistance research, another Administration priority area, and appropriators in both chambers provided approximately four percent funding increases to NIH's Institutional Development Awards (IDeA) program, which seeks to broaden the geographic distribution of NIH dollars, similar to EPSCoR.

Ultimately, if Congress can come to an omnibus agreement in a reasonable timeframe, NIH appears poised to tally another year of solid funding gains. And the fiscal picture could look even better if Congress enacts the funding mechanisms in the pending 21st Century Cures Act, which would provide an additional multibillion dollar, multiyear funding stream to NIH.⁸

⁸ See <http://www.sciencemag.org/news/2016/04/us-senators-advance-biomedical-innovation-bills-key-nih-funding-issue-unresolved>

National Institutes of Health R&D Appropriations (budget authority in millions of dollars)									
Total by Institute	2015	2016	2017 Pres.	2017 House	Percent Change		2017 Senate	Percent Change	
					Pres.	FY16		Pres.	FY16
Cancer	4,953	5,214	5,097	5,338	4.7%	2.4%	5,430	6.5%	4.1%
Allergy and Infect Diseases	4,418	4,716	4,701	4,739	0.8%	0.5%	4,961	5.5%	5.2%
Heart, Lung, and Blood	2,996	3,114	3,070	3,190	3.9%	2.5%	3,243	5.6%	4.1%
General Medical Sciences	2,372	2,512	2,434	2,584	6.2%	2.8%	2,634	8.2%	4.8%
Diabetes, Digest, and Kidney 1/	1,899	1,966	1,936	2,012	3.9%	2.3%	2,042	5.5%	3.8%
Neurological Disorders	1,605	1,695	1,659	1,751	5.5%	3.3%	1,803	8.7%	6.4%
Mental Health	1,434	1,519	1,460	1,600	9.6%	5.3%	1,620	10.9%	6.6%
Child Health & Human Dev	1,287	1,338	1,317	1,373	4.3%	2.6%	1,396	6.0%	4.3%
Nat Ctr for Adv Translational Sci	633	685	660	713	8.0%	4.0%	714	8.1%	4.1%
Office of the Director 2/	1,414	1,571	1,445	1,689	16.8%	7.5%	1,744	20.6%	11.0%
Aging	1,198	1,598	1,265	1,982	56.7%	24.0%	2,067	63.4%	29.3%
Drug Abuse	1,016	1,051	1,020	1,108	8.5%	5.4%	1,103	8.1%	5.0%
Environmental Health Scis	667	694	682	710	4.2%	2.4%	722	6.0%	4.1%
<i>Superfund 3/</i>	77	77	77	77	0.0%	0.0%	77	0.0%	0.0%
<i>NIEHS Total</i>	745	771	759	788	3.8%	2.2%	800	5.4%	3.7%
Eye	677	708	687	736	7.0%	3.9%	741	7.8%	4.6%
Arthritis / Musculoskeletal	522	542	533	555	4.2%	2.5%	564	5.9%	4.1%
Human Genome	499	513	510	531	4.3%	3.5%	535	4.9%	4.1%
Alcohol Abuse and Alcoholism	447	467	460	480	4.5%	2.8%	489	6.4%	4.6%
Deafness and Communication	405	423	416	434	4.3%	2.6%	442	6.2%	4.5%
Dental Research	398	413	405	426	5.2%	2.9%	431	6.4%	4.1%
National Library of Medicine	337	396	395	403	2.0%	1.9%	412	4.3%	4.1%
Biomed / Bioengineering	327	344	334	357	6.9%	3.9%	361	8.1%	5.1%
Minority Health / Disparities	271	281	280	286	2.4%	2.1%	292	4.5%	4.1%
Nursing Research	141	146	144	150	4.2%	2.8%	152	5.6%	4.1%
Complementary and Int Health	124	130	127	135	6.2%	3.5%	136	7.5%	4.8%
Buildings and Facilities	129	129	129	129	0.0%	0.0%	129	0.0%	0.0%
Fogarty International Center	68	70	69	72	4.3%	2.9%	73	5.6%	4.1%
Total NIH Budget	30,311	32,311	31,311	33,561	7.2%	3.9%	34,311	9.6%	6.2%
<i>Training & Overhead</i>	<i>-1,561</i>	<i>-1,693</i>	<i>-1,719</i>	<i>-1,547</i>			<i>-1,532</i>		
Total NIH R&D	28,750	30,618	29,592	32,014	8.2%	4.6%	32,780	10.8%	7.1%
Conduct of R&D	28,613	30,474	29,424	31,846	8.2%	4.5%	32,612	10.8%	7.0%
R&D Facilities & Equipment	137	145	168	168	0.0%	15.9%	168	0.0%	15.9%

1/ Includes up to \$150 million each year in mandatory diabetes research funds.
2/ Trans-NIH initiatives are consolidated in OD.
3/ Transfers from the Dept of the Interior.
Excludes supplemental FY 2017 Zika proposal and supplemental FY 2015 Ebola funding.
FY 2016 figures are current estimates. Inflation from FY16-17 is 1.8 percent

Department of Energy

Spending Bill: Energy & Water (H.R. 5055; S. 2804);
Latest Approvals: House Appropriations Committee on April 19 (failed House vote May 26); Senate on May 12

Last fall the President’s announcement of the Mission Innovation initiative⁹ – a multinational pledge to double clean energy R&D budgets in five years – seemed set to recharge the debate on low-carbon technology. But while it may have generated some discussion and favorable rhetoric, the proposal has had only limited impact on the bottom line for FY 2017 funding. Similar to past years, the Administration had called for a major increase in clean energy technology funding (as seen in the below table and charts), and once again this summer’s appropriations debate saw Republican appropriators de-prioritize energy efficiency and renewables relative to other technology sources. The Department of Energy (DOE) Office of Science also received only modest increases in both chambers of Congress. In contrast, the National Nuclear Security Administration (NNSA) – responsible for sustaining and safeguarding the nation’s nuclear stockpile and for developing nuclear propulsion for the U.S. Navy – continued to receive general funding support given its national security relevance.

The Energy & Water appropriations bill, which funds DOE, was also among those spending bills that stalled out on the House and Senate floors over policy riders. In the Senate, the debate was held up for some weeks over an amendment to block the federal government from purchasing Iranian heavy water,¹⁰ though the amendment was eventually defeated and the Senate approved the final bill by an overwhelming 90-8 vote. In the House, the amendment fight was primarily over LGBT rights, among other issues,¹¹ and in the end 130 Republicans and 175 Democrats joined together to defeat the bill.

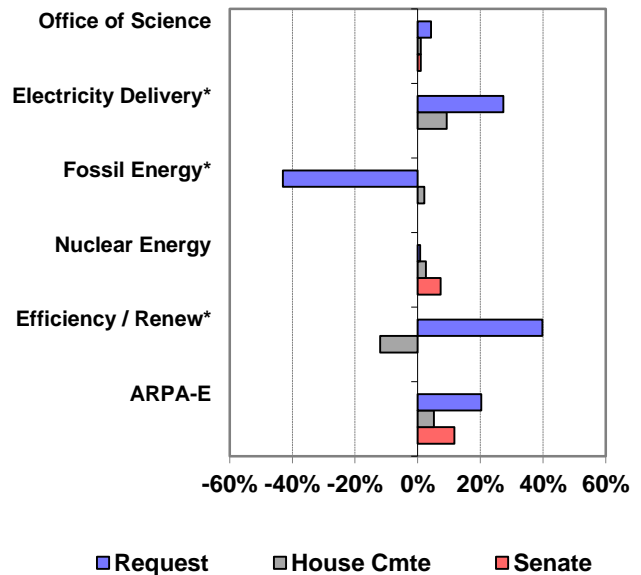
The Office of Science (SC), DOE’s basic research arm, coincidentally only received a one percent increase in both chambers (see table), though the allocation among SC’s research programs was very different. This is primarily due to the differing takes on ITER, the international fusion energy project under construction in France, funded through DOE’s Fusion Energy program. As seen in the below table, House appropriators granted the

⁹ <https://www.whitehouse.gov/blog/2015/11/29/announcing-mission-innovation>

¹⁰ <http://thehill.com/policy/national-security/277640-cotton-tries-to-block-us-from-buying-irans-nuclear-material>

¹¹ <http://www.politico.com/story/2016/05/lgbt-fight-sinks-house-spending-bill-223606>

FY 2017 Energy Program Budgets
 percent change from FY16, nominal dollars



*Flat funding in Senate.
 Inflation is 1.8 percent. © 2016 AAAS

Administration’s requested \$15 million increase, while protecting the fusion program’s domestic activities from proposed cuts. On the other hand, Senate appropriators zeroed out ITER and reallocated that funding to other SC programs, while also adopting the proposed domestic cuts. Similar divisions over U.S. funding of ITER have appeared in prior appropriations cycles, though the program has managed to survive on, for now. Elsewhere, the Biological and Environmental Research program is again a source of divergence, with the Senate boosting the program for, in part, climate modeling activities, and House appropriators levying another round of moderate cuts. House appropriators also underfunded the Energy Frontier Research Centers (EFRC) initiative, funded through the Basic Energy Sciences program. The House provided \$97.8 million for the EFRCs, 45.8 percent below the requested \$142.6 million. The Senate bill did not specify a figure.

Beyond these differences, there were some areas in which appropriators in both chambers matched, or nearly matched, the funding request. These included funding for SC’s exascale computing initiative; the Facility for Rare Isotope Beams construction; the Linac Coherent Light Source upgrade; and the Long Baseline Neutrino Experiment, which received some extra dollars in both chambers.

FY 2017 Appropriations

As mentioned above and seen in the funding table, DOE’s applied energy technology programs have been subject to the usual divisions along party and chamber lines. Among these programs, two winners stand out, though one is hard to see. First, the Advanced Research Projects Agency-Energy (ARPA-E), DOE’s relatively young

innovation office, has managed to secure relatively generous funding increases in both chambers. Second, while the Fossil Energy R&D program would see only limited change from FY 2016 levels, the way the program is funded is markedly different from the request: the Administration had proposed redirecting \$240 million in

Department of Energy Appropriations (budget authority in millions of dollars)									
Program / Account*	2015	2016	2017 Pres.	2017 House	Percent Change		2017 Senate	Percent Change	
					Pres.	FY16		Pres.	FY16
Office of Science	5,068	5,347	5,572	5,400	-3.1%	1.0%	5,400	-3.1%	1.0%
<i>Adv Sci Computing Res</i>	523	621	663	621	-6.4%	0.0%	656	-1.1%	5.7%
<i>Basic Energy Sci</i>	1,683	1,849	1,937	1,860	-4.0%	0.6%	1,913	-1.2%	3.4%
<i>Bio and Enviro Res</i>	573	609	662	595	-10.1%	-2.3%	637	-3.8%	4.6%
<i>Fusion Energy</i>	457	438	398	450	13.0%	2.7%	280	-29.6%	-36.0%
<i>ITER</i>	150	115	125	125	0.0%	8.7%	0	-100.0%	-100.0%
<i>High Energy Physics</i>	745	795	818	823	0.6%	3.5%	833	1.8%	4.8%
<i>Nuclear Physics</i>	581	617	636	620	-2.5%	0.5%	636	0.0%	3.0%
Energy Programs									
<i>Energy Effic & Renew Energy</i>	1,841	2,073	2,898	1,825	-37.0%	-12.0%	2,073	-28.5%	0.0%
<i>Elect Deliv & Energy Reliab</i>	144	206	262	225	-14.2%	9.2%	206	-21.5%	0.0%
<i>Nuclear Energy</i>	822	986	994	1,012	1.8%	2.6%	1,058	6.4%	7.3%
<i>Fossil Energy R&D</i>	549	632	360	645	79.2%	2.1%	632	75.6%	0.0%
<i>ARPA-E</i>	280	291	350	306	-12.6%	5.1%	325	-7.1%	11.7%
Atomic Energy Defense Activities	17,140	18,593	18,903	18,913	0.1%	1.7%	19,038	0.7%	2.4%
NNSA	11,397	12,527	12,884	12,910	0.2%	3.1%	12,867	-0.1%	2.7%
Weapons Activities	8,181	8,847	9,243	9,285	0.5%	5.0%	9,285	0.5%	5.0%
<i>Science Campaign</i>	412	423	442	434	-1.7%	2.7%	440	-0.6%	3.9%
<i>Engineering Campaign</i>	136	131	139	139	0.0%	6.2%	126	-9.4%	-3.8%
<i>Inertial Confn Fusion</i>	513	511	523	523	0.0%	2.3%	523	0.0%	2.3%
<i>Adv Sim & Computing</i>	598	623	663	634	-4.4%	1.8%	663	0.0%	6.4%
<i>Adv Manuf Campaign</i>	107	130	87	87	0.0%	-33.0%	87	0.0%	-33.0%
Defense Nuclear Nonprolif	1,613	1,940	1,808	1,822	0.8%	-6.1%	1,822	0.8%	-6.1%
<i>Nonproliferation R&D</i>	386	419	394	492	24.8%	17.2%	407	3.3%	-3.0%
Naval Reactors	1,234	1,375	1,420	1,420	0.0%	3.2%	1,352	-4.8%	-1.7%
Total DOE R&D Estimate	14,385	14,387	16,634	15,675	-5.8%	9.0%	15,757	-5.3%	9.5%
DOE R&D by Function									
Defense	6,197	5,726	7,082	7,043	-0.5%	23.0%	6,978	-1.5%	21.9%
General Science	5,099	5,305	5,523	5,352	-3.1%	0.9%	5,352	-3.1%	0.9%
Energy	3,089	3,356	4,029	3,280	-18.6%	-2.3%	3,427	-15.0%	2.1%
* Discretionary budgets (includes non-R&D components) Excludes R&D funded through new mandatory proposals in FY 2017. FY 2016 figures are current estimates. Inflation from FY16-17 is 1.8 percent.									

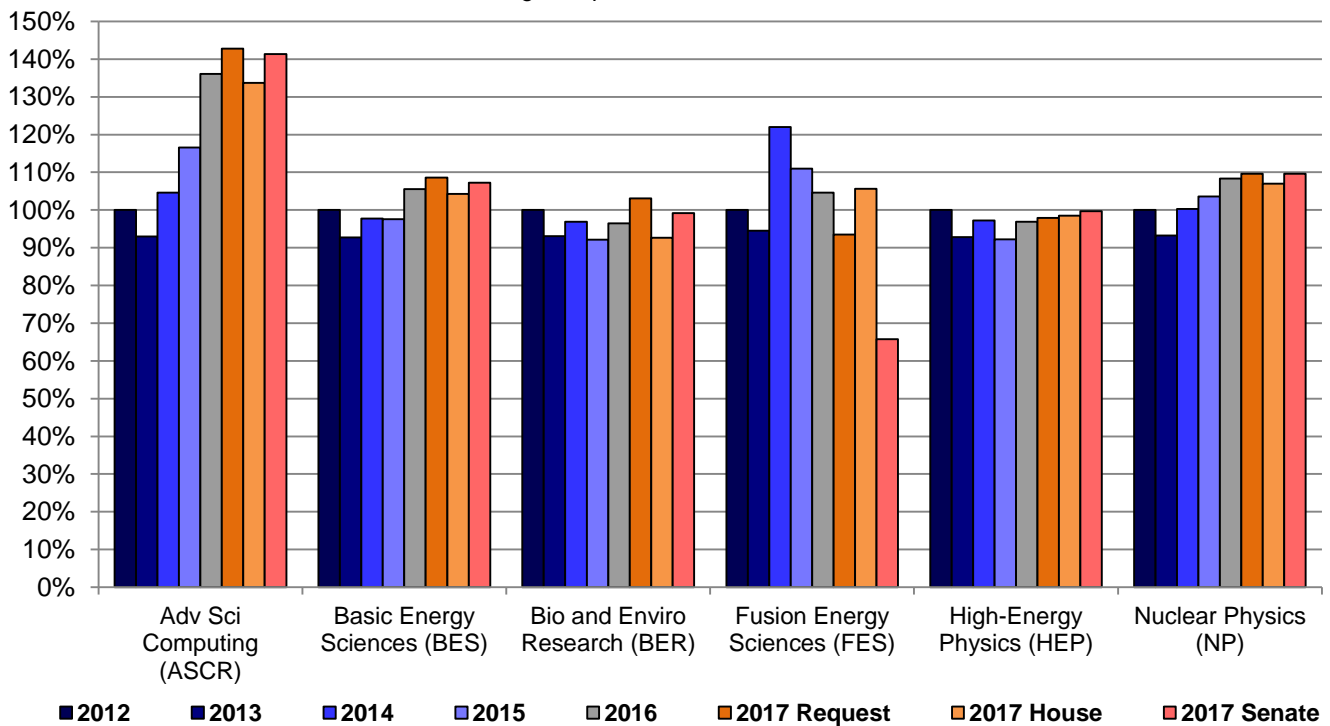
previously-approved funding authority from DOE’s Clean Coal Power Initiative (CCPI) to cover programs in FY 2017. Appropriators in neither chamber went along with this, and instead protected CCPI program funding while providing the Fossil Energy office with entirely new funding in FY 2017.

Elsewhere, appropriators in neither chamber provided funding for the Administration’s proposed grid technology manufacturing institute or for a new initiative on regional energy innovation. Senate appropriators did provide an 11.2 percent increase for DOE’s Advanced Manufacturing Office, including funding for a new proposed Energy-Water Desalination Hub, but would trim most other efficiency and renewable energy programs. House appropriators would make much

deeper cuts to most of these programs, though the House bill also provides the requested funding for one new manufacturing institute within the Office of Energy Efficiency and Renewable Energy (EERE).

While the Office of Nuclear Energy would seemingly be granted a 7.3 percent funding increase in the Senate bill, this is primarily due to a funding shift for the Advanced Test Reactor at Idaho Lab, which had previously received funding through NNSA. Both chambers would also boost advanced reactor technology funding at the expense of R&D on fuel cycle waste.

DOE Office of Science Program Budgets
 Estimated funding as a percent of FY 2012, in constant dollars



Source: AAAS analyses of agency budget documents and appropriations bills and reports. Figures include non-RD. © 2016 AAAS

NASA

Spending Bill: Commerce, Justice, Science (H.R. 5393; S. 2837)

Latest Approvals: House Appropriations Committee on May 24; Senate Appropriations Committee on April 21

Coming into the appropriations cycle, the President had proposed a full \$1 billion reduction in NASA’s discretionary budget, with a \$763 million mandatory spending package to partially offset the decline. Even including this extra mandatory funding, the space agency would face a 1.3 percent decrease below last year’s estimated level under the request. Appropriators soundly rejected these large decreases, and it now appears likely that a more generous outcome will materialize in a year-end spending package. The debates between Congress and the Administration over NASA’s budget have been similar to those from previous years: appropriators continue to dismiss the proposed cuts to the Space Launch System (SLS) rocket and the Orion Crew Vehicle, while the chambers moved again in different directions on the Planetary Science and Earth Science programs amidst sustained criticism over a planned asteroid

retrieval mission.

NASA’s Science Mission Directorate (SMD) was again a major source of dispute during House appropriations proceedings. Within SMD, the Earth Science program would be cut by 14.3 percent below the President’s request with funding shifted to the Planetary Science account, due in no small part to efforts by House Appropriations Subcommittee Chairman John Culberson (R-TX) to shore up funding for a mission to Jupiter’s moon Europa. The House bill would provide \$260 million to stay on track for a Europa launch no later than 2022, while only \$50 million was slated in the President’s discretionary request. The Administration proposed a Europa launch in the late 2020s and recommended against the earlier launch date preferred by House appropriators.

Meanwhile, the Senate committee took the reverse approach, opting to boost Earth Science slightly above the request and correspondingly decrease the Planetary Science account (see table). The Senate bill also includes the requested \$131 million for formulation of Landsat 9, the next in the series of Earth imaging satellites; the

NASA R&D Appropriations (budget authority in millions of dollars)									
Program / Account	2015	2016	2017 Pres.	2017			2017		
				House	Percent Change		Senate	Percent Change	
					Pres.	FY16		Pres.	FY16
Science	5,243	5,589	5,303	5,597	5.6%	0.1%	5,395	1.7%	-3.5%
<i>Earth Science</i>	1,784	1,921	1,972	1,690	-14.3%	-12.0%	1,984	0.6%	3.3%
<i>Planetary Science</i>	1,447	1,631	1,391	1,846	32.7%	13.2%	1,356	-2.5%	-16.9%
<i>Astrophysics</i>	731	768	697	793	13.8%	3.3%	807	15.9%	5.1%
<i>J Webb Space Telescope</i>	645	620	569	569	0.0%	-8.2%	569	0.0%	-8.2%
<i>Heliophysics</i>	636	650	674	699	3.7%	7.5%	679	0.7%	4.4%
Exploration	3,543	4,030	3,164	4,183	32.2%	3.8%	4,330	36.9%	7.4%
<i>Exploration Systems</i>	3,212	3,680	2,687	3,779	40.7%	2.7%	3,934	46.4%	6.9%
<i>Orion Crew Vehicle</i>	1,190	1,270	1,053	1,350	28.2%	6.3%	1,300	23.4%	2.4%
<i>Space Launch System</i>	1,679	2,000	1,230	2,000	62.6%	0.0%	2,150	74.8%	7.5%
<i>Exploration R&D</i>	331	350	477	404	-15.4%	15.4%	396	-17.0%	13.1%
Aeronautics	642	640	635	712	12.2%	11.3%	601	-5.3%	-6.1%
Space Technology	600	687	691	739	7.0%	7.7%	687	-0.6%	0.0%
Space Operations	4,626	5,029	5,076	4,890	-3.7%	-2.8%	4,951	-2.5%	-1.6%
Other*	3,357	3,310	3,395	3,387	-0.2%	2.3%	3,343	-1.5%	1.0%
Total NASA Budget	18,010	19,285	18,262	19,508	6.8%	1.2%	19,306	5.7%	0.1%
Total R&D Estimate	11,413	13,273	12,170	13,368	9.8%	0.7%	13,179	8.3%	-0.7%

* Includes Education, Cross-Agency Support, Construction and Environmental Compliance and OIG.
Excludes R&D funded through new mandatory proposals in FY 2017.
FY 2016 figures are current estimates. Inflation from FY16-17 is 1.8 percent

House committee directs NASA to prioritize funds for continued development of Landsat 9 but does not specify an amount.

For the Mars Rover 2020 mission, the Senate committee included an additional \$10 million above the requested amount of \$377.5 million, while their House counterparts opted for an even larger \$30.5 million increase. Mars 2020 will seek signs of past life on Mars, and collect samples for potential return to Earth in the future. Within the Astrophysics program, the Wide-Field Infrared Survey Telescope (WFIRST), the next major observatory beyond James Webb and the highest-priority large mission in the latest decadal survey, was funded at \$120 million by the Senate committee, whereas the Administration would have flat-funded WFIRST at \$90 million, largely through new mandatory spending; the House bill does not specify a funding amount for WFIRST, though House appropriators would provide a moderate increase to Astrophysics overall.

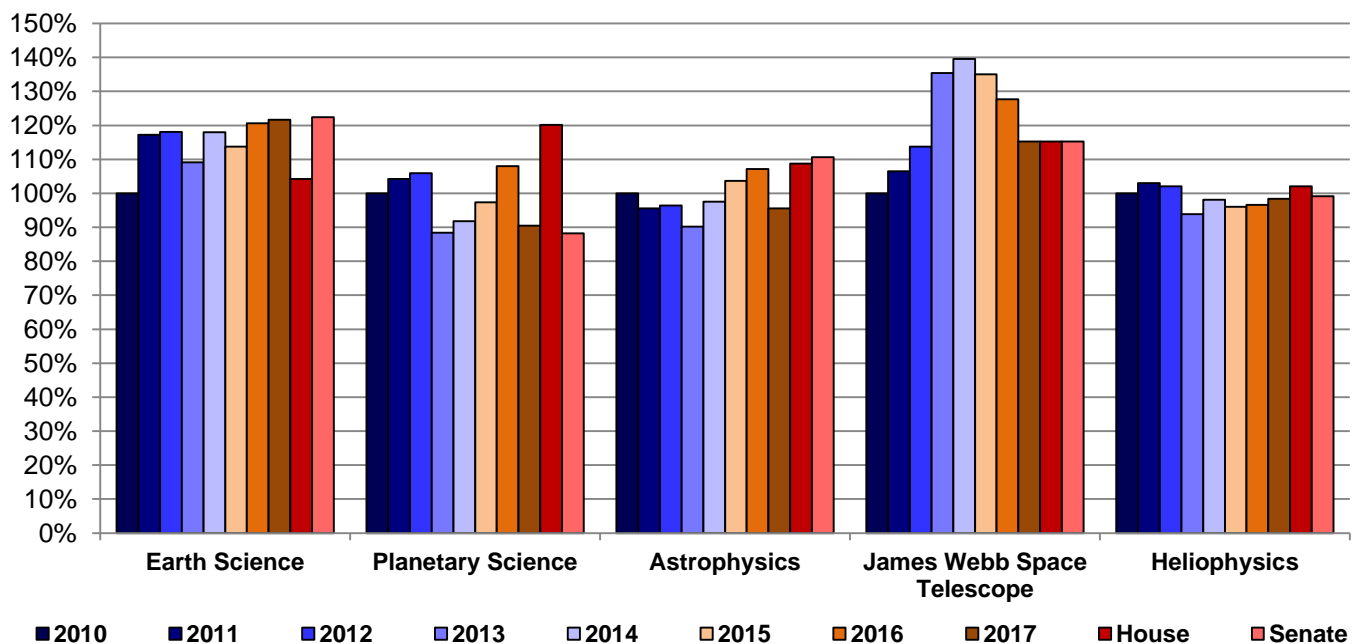
NASA’s Exploration account, which contains the Orion program and Space Launch System (SLS), saw significant gains from Congress as is usual. However, the House version of the NASA funding bill recommends against pursuing the Administration’s proposed Asteroid Redirect Mission (ARM), though the committee recognizes some of the benefits of the technology that is

under development as part of ARM, namely advanced propulsion. Vocal opposition to ARM has been absent from Senate proceedings. Additionally, Senate appropriators match the requested funding level for the Commercial Crew program, which aims to build public-private sector spaceflight partnerships towards NASA’s goal of reducing reliance on Russia for transporting astronauts to the International Space Station. Although the Administration is not asking for another increase for Commercial Crew, Congress has been hostile towards program funding in the past: FY 2016 marked the first year that Congress appropriated its full request amount. The House bill does not include a specific amount for Commercial Crew, and expresses concern that some fiscal year 2016 and 2017 project milestones have slipped.

Within the Space Technology Mission Directorate (STMD), the RESTORE-L mission, which aims to demonstrate the servicing of a government satellite in low Earth orbit, was slated by Senate appropriators to receive \$130 million; the Administration had proposed the same amount, though nearly half via mandatory spending. The House committee does not specify an amount for RESTORE-L, though the total STMD budget is significantly above both the Senate committee and Administration’s request (see table). Elsewhere, the House bill directs NASA to begin planning for an

NASA Science Mission Directorate in FY 17 Appropriations

Estimated funding as a percent of FY 2010, in constant dollars

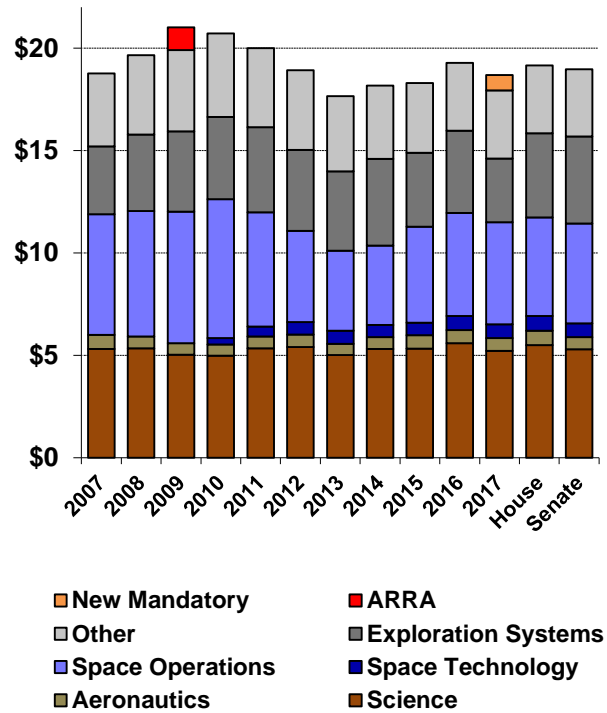


Source: Historical agency budget documents and the FY 2017 budget request. FY 2017 excludes new mandatory proposals. © 2016 AAAS

interstellar mission to Alpha Centauri within the next half-century.

As for Aeronautics, the Senate committee is less generous, prescribing a \$34 million or 5.3 percent cut below the President’s request and 6.1 percent below last year. On the other hand, House appropriators provided a substantial 11.3 percent boost above FY 2016 for Aeronautics, including funding for a project to develop quieter supersonic flight; NASA had originally included this project as part of its mandatory funding request, but House appropriators instead added the project into the base NASA budget.

NASA Budgets, FY 2007 - 2017
in billions of constant 2016 dollars



"Other" includes support, construction, OIG, and education programs.
FY 2017 is the request. © 2016 AAAS

National Science Foundation

Spending Bill: Commerce, Justice, Science (H.R. 5393; S. 2837)

Latest Approvals: House Appropriations Committee on May 24; Senate Appropriations Committee on April 21

The majority of National Science Foundation (NSF) R&D sits within the Research and Related Activities (R&RA) account, which funds the six directorates responsible for promoting basic research across a wide range of disciplines. In the President’s budget, the Administration had provided R&RA with a small 0.8 increase in base discretionary funding above FY 2016, and a sub-inflation 1.3 percent increase in NSF’s total budget. Appropriations have differed little on R&RA funding but completely diverged when it comes to NSF facilities construction, which would see a large drop in the House and a boost in the Senate.

While past funding cycles have seen House legislators attempt to cut both the Geosciences and the Social, Behavioral, and Economic Sciences directorates, this year’s version of the House bill abandons these efforts and provides a single lump sum for all R&RA as is

customary, matching the President’s request in the process (see table). Senate appropriators would flat-fund R&RA in spite of the fact that the Senate Commerce Committee passed an NSF reauthorization allowing for 4.0 percent funding increases over the next two years.¹²

Among cross-foundation investments, the House Appropriations Committee provided \$147 million for neuroscience and cognitive science activities at NSF including the BRAIN Initiative, an amount equal to FY 2016 levels and \$5.3 million above the President’s discretionary budget request; the Senate bill does not specify an amount. House appropriators also granted \$5 million above the FY 2016 level for NSF’s Innovation Corps (I-Corps) program, which was flat-funded in the request at a total \$30 million; the Senate bill offers supporting language for I-Corps within its overall flat R&RA budget.

A major area of divergence between the Administration, the House, and the Senate is funding for NSF’s Major Research Equipment and Facilities Construction (MREFC) account. The House committee recommends a steep cut of 56.5 percent below FY 2016 levels and 54.9 percent

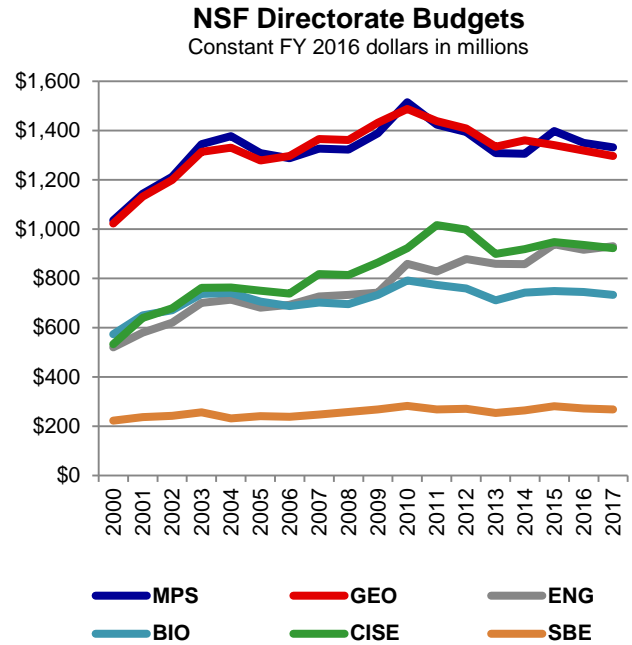
National Science Foundation R&D Appropriations (budget authority in millions of nominal dollars)										
Program / Account	2015	2016	2017 Pres.	2017			2017			
				House	Percent Change		Senate	Percent Change		
					Pres.	FY16		Pres.	FY16	
Research and Related Activities (R&RA)	6,042	6,034	6,079	6,079	0.0%	0.8%	6,034	-0.8%	0.0%	
<i>Biological Sciences (BIO)*</i>	736	744	746	--	--	--	--	--	--	
<i>Computer and Info Sci and Eng (CISE)*</i>	933	936	938	--	--	--	--	--	--	
<i>Engineering (ENG)*</i>	924	916	946	--	--	--	--	--	--	
<i>Geosciences (GEO)*</i>	1,319	1,319	1,320	--	--	--	--	--	--	
<i>Mathematical and Physical Sci (MPS)*</i>	1,376	1,349	1,355	--	--	--	--	--	--	
<i>Social, Behavioral, and Econ Sci (SBE)*</i>	276	272	272	--	--	--	--	--	--	
<i>Integrative Activities*</i>	427	447	451	--	--	--	--	--	--	
<i>Office of Internatl Sci and Eng*</i>	48	49	49	--	--	--	--	--	--	
<i>Arctic Research Commission*</i>	48	49	49	--	--	--	--	--	--	
Major Research Equip & Facils (MREFC)	145	200	193	87	-54.9%	-56.5%	247	27.7%	23.1%	
Education & Human Resources (EHR)	886	880	899	880	-2.1%	0.0%	880	-2.1%	0.0%	
Other 1/	325	350	393	360	-8.4%	2.9%	350	-11.0%	0.0%	
Total NSF Budget	7,398	7,464	7,564	7,406	-2.1%	-0.8%	7,510	-0.7%	0.6%	
Total Estimated NSF R&D	5,990	6,117	6,160	5,929	-3.8%	-3.1%	6,088	-1.2%	-0.5%	
*Appropriators do not allocate funding by directorate.										
1/ Includes Agency Operations, National Science Board and OIG funding.										
Excludes R&D funded through new mandatory proposals in FY 2017.										
FY 2016 figures are current estimates. Inflation from FY16-17 is 1.8 percent.										

¹² See <http://www.sciencemag.org/news/2016/06/out-out-red-tape-congress-weighs-bills-reduce-regulatory-burden-academic-science>

below the President’s request (see table), denying the Administration’s request for additional funding to begin construction of two Regional Class Research Vessels; FY 2017 would mark the first year of the three-year construction phase according to the request. House Appropriations Subcommittee Chairman John Culberson (R-TX) has argued that there are already underutilized research ships around the country.¹³ Meanwhile, the Senate committee appropriated \$53.5 million above the request to add a third research vessel. Elsewhere, both committees include funding at the requested level for the Daniel K. Inouye Solar Telescope (DKIST), which will be the world’s most powerful telescope when completed in 2019, and the Large Synoptic Survey Telescope (LSST), currently under construction in Chile with full operations commencing in 2022.

The Education and Human Resources (EHR) Directorate budget would remain the same as the previous fiscal year in both bills, and \$19 million or 2.1 percent below the President’s request. The Experimental Program to Stimulate Competitive Research (EPSCoR), which aims to broaden participation in science and engineering and avoid concentration of NSF research dollars throughout the states, was given a total \$171 million or 6.7 percent increase by the House committee, compared to a 1.3 percent increase in the President’s discretionary request; the Senate committee recommended flat funding at the FY 2016 amount.

Lastly, appropriators would provide only flat funding or a much smaller increase than requested for Agency Operations, which contains the Administration’s proposed \$34 million increase to prepare for the planned NSF headquarters move from Arlington, VA to Alexandria, VA, in 2017.



AAAS estimates based on NSF data and the FY 2017 request. GEO and CISE have been adjusted for comparability. © 2016 AAAS

¹³ See <http://www.sciencemag.org/news/2016/05/house-panel-would-block-nsf-building-two-new-ships>

Department of Agriculture

Spending Bill: Agriculture (H.R. 5054; S. 2956)

Latest Approvals: House Appropriations Committee on April 19; Senate Appropriations Committee on May 19

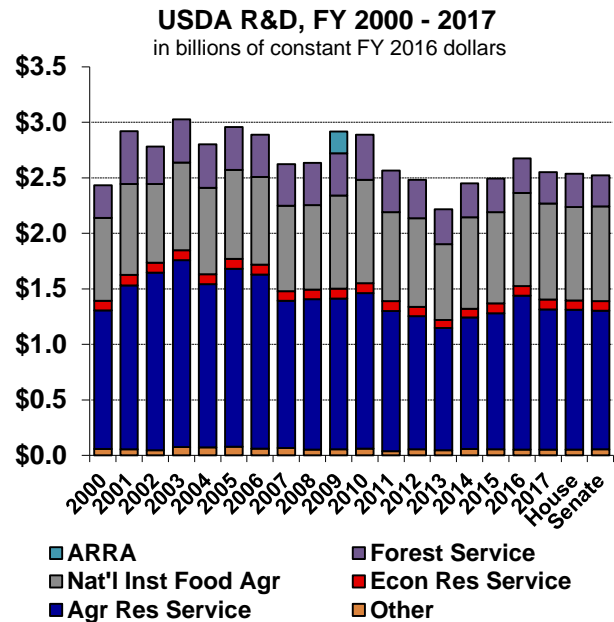
Spending Bill: Interior and Environment (H.R. 5538; S. 3068)

Latest Approvals: House on July 14; Senate Appropriations Committee on June 16

USDA’s research budget appears headed for mostly modest increases following appropriations decisions this spring. At the start of the budget cycle, the President sought to double the Agriculture and Food Research Initiative (AFRI), USDA’s growing competitive grants program, to its authorized level of \$700 million. However, most of this boost would be achieved through proposed new mandatory spending, a funding mechanism rejected by Congress. AFRI’s base discretionary budget, slated for a much smaller though still significant \$25 million increase in the FY 2017 request, was matched by both the House and Senate appropriations committees (see table).

Overall funding for the National Institute of Food and Agriculture (NIFA), USDA’s extramural research agency, would see a small 2.4 percent gain from the Senate Appropriations Committee and a sub-inflationary increase on the House side, both below the request. NIFA’s formula fund programs for colleges and universities would again be flat-funded by appropriators.

The intramural Agricultural Research Service (ARS), USDA’s main in-house research arm, was slated for a



Source: AAAS R&D reports, agency budget documents, and appropriations reports. FY 2017 is the request. © 2016 AAAS

large decrease by the Administration, though this is mostly due to reduced facilities funding following last year’s large appropriation for construction of a new Southeast Poultry Research Lab in Athens, GA, at a cost of \$160 million. Senate appropriators did provide some extra funding for the ARS research account above the President’s request, which had sought increases for antimicrobial resistance, climate resilience, and water use research within a relatively constrained overall budget.

U.S. Department of Agriculture R&D Appropriations (budget authority in millions of dollars)										
Program / Account*	2015	2016	2017 Pres.	2016		Percent Change		2017 Senate	Percent Change	
				House	Pres.	Pres.	FY16		Pres.	FY16
Agri Research Service (ARS)	1,176	1,356	1,256	1,251	-0.4%	-7.7%	1,242	-1.1%	-8.4%	
<i>Salaries and Expenses</i>	1,133	1,144	1,161	1,151	-0.8%	0.7%	1,178	1.4%	2.9%	
<i>Buildings and Facilities</i>	45	212	95	100	5.4%	-53.0%	64	-32%	-70%	
Nat Inst Food Agri (NIFA)	1,295	1,331	1,379	1,341	-2.7%	0.7%	1,364	-1.1%	2.4%	
<i>Agri Food Res Init (AFRI)</i>	325	350	375	375	0.0%	7.1%	375	0.0%	7.1%	
Economic Research Service	85	85	91	86	-5.8%	0.7%	87	-5.0%	1.6%	
Nat Agriculture Stats Serv	172	168	177	168	-4.6%	0.0%	170	-4.0%	0.7%	
Forest Service										
<i>Forest and Rangeland Research</i>	296	291	292	302	3.4%	3.8%	280	-4.1%	-3.8%	
Total Estimated USDA R&D	2,454	2,674	2,598	2,581	-0.7%	-3.5%	2,567	-1.2%	-4.0%	

*Program figures may include funding for non-R&D activities.
Excludes R&D funded through new mandatory proposals in FY 2017.
FY 2016 figures are current estimates. Inflation from FY 16-17 is 1.8 percent.

Both House and Senate appropriators fell short of the request for the Economic Research Service (ERS) and the National Agricultural Statistics Service (NASS), while the two chambers diverged on the U.S. Forest Service research account, which is funded through the Interior bill (see table).

Total estimated USDA R&D would drop by 3.5 percent in the House and 4.0 percent in the Senate, though again this is mostly due to the ARS construction changes noted above. Excluding construction funding, estimated USDA R&D would rise by 1.6 percent in the Senate, matching the President's requested level, while the House appropriation would amount to an 0.8 percent increase.

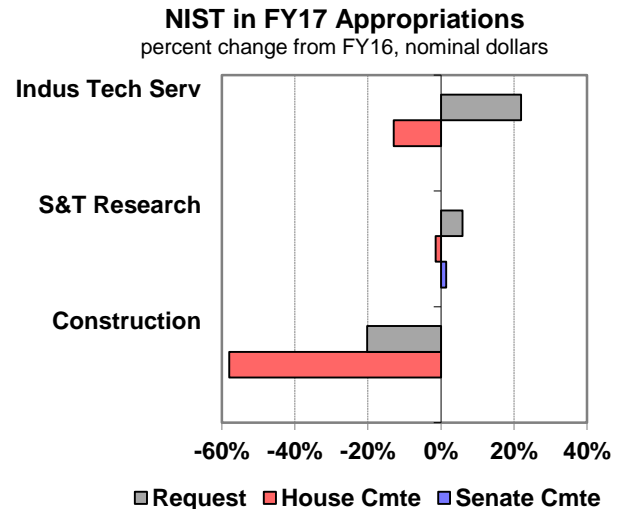
Department of Commerce

Spending Bill: Commerce, Justice, Science (H.R. 5393; S. 2837)

Latest Approvals: House Appropriations Committee on May 24; Senate Appropriations Committee on April 21

The two major Commerce R&D agencies, the National Oceanic and Atmospheric Administration (NOAA) and the National Institute of Standards and Technology (NIST), would receive substantially less from House and Senate appropriators than what the Administration requested. Congress once again rejected the Administration's attempt to expand a network of manufacturing innovation institutes administered by NIST, and funding for NOAA's climate research would be significantly cut below last year's levels in the House, continuing the climate research debate emphatically.

The House committee's overall \$865 million allocation for NIST is well below the President's request and the FY 2016 enacted amount (see funding table). House



ITS and Construction received flat funding in the Senate. Some figures include non-R&D. Inflation is 1.8 percent. © 2016 AAAS

appropriators would assign a \$10 million or 1.4 percent cut to NIST's Scientific and Technical Research and Services account, which funds the agency's seven

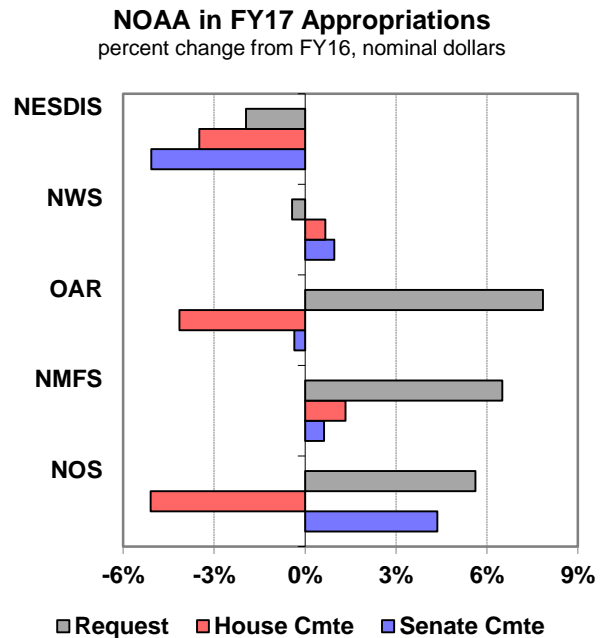
Department of Commerce R&D Appropriations (budget authority in millions of dollars)									
Program / Account**	2015	2016	2017 Pres.	2017 House	Percent Change		2017 Senate	Percent Change	
					Pres.	FY16		Pres.	FY16
Natl Inst of Standards and Tech (NIST)	864	964	1,015	865	-14.7%	-10.3%	974	-4.0%	1.0%
Sci & Tech Research and Services	676	690	731	680	-6.9%	-1.4%	700	-4.2%	1.4%
Industrial Technology Services	138	155	189	135	-28.6%	-12.9%	155	-18.0%	0.0%
<i>NNMI</i>	--	25	47	5	-89.4%	-80.0%	25	-46.8%	0.0%
<i>Hollings Manuf Ext Partnership</i>	130	130	142	130	-8.4%	0.0%	130	-8.4%	0.0%
Construction of Research Facilities	50	119	95	50	-47.4%	-58.0%	119	25.3%	0.0%
Total NIST R&D Estimate	669	773	806	702	-12.9%	-9.1%	794	-1.5%	2.7%
Natl Oceanic and Atmos Admin (NOAA)	5,449	5,774	5,851	5,581	-4.6%	-3.3%	5,691	-2.7%	-1.4%
Natl Ocean Service*	485	504	532	478	-10.1%	-5.1%	526	-1.2%	4.4%
Natl Marine Fisheries Service*	822	849	905	861	-4.9%	1.3%	855	-5.5%	0.6%
Oceanic and Atmos Res*	446	482	520	462	-11.1%	-4.1%	480	-7.6%	-0.4%
<i>Climate Research</i>	158	158	190	128	-32.6%	-19.0%	158	-16.8%	0.0%
<i>Weather and Air Chem Research</i>	91	103	102	118	15.9%	14.5%	98	-3.5%	-4.6%
<i>Ocean, Coastal, Great Lakes Res</i>	172	189	179	177	-1.2%	-6.0%	181	1.0%	-3.9%
Natl Weather Service*	1,087	1,124	1,119	1,132	1.1%	0.7%	1,135	1.4%	1.0%
NESDIS* 1/	2,223	2,349	2,304	2,267	-1.6%	-3.5%	2,230	-3.2%	-5.1%
Off of Marine and Aviat Ops*	213	303	258	237	-8.1%	-21.7%	298	15.4%	-1.7%
Total NOAA R&D Estimate	692	805	810	731	-9.7%	-9.2%	777	-4.1%	-3.5%
Total Commerce R&D Estimate	1,527	1,904	1,879	1,669	-11.2%	-12.4%	1,814	-3.4%	-4.7%

*ORF and PAC funding
 ** Discretionary budgets (includes non-R&D components)
 1/ National Environmental Satellite, Data, and Information Service
 Excludes R&D funded through new mandatory proposals in FY 2017.
 FY 2016 figures are current estimates. Inflation from FY16-17 is 1.8 percent

research labs. The House version of the bill denies funding for NIST’s lab-to-market program as well as the Urban Dome Program, which monitors environmental and human health conditions in densely populated areas. Meanwhile, the Senate committee did provide a slight increase for NIST’s research and laboratory programs, including the full requested level for biomanufacturing activities. Additionally, Senate appropriators provided \$75.7 million, \$1.5 million above the request, for cybersecurity R&D programs, among them the National Cybersecurity Center of Excellence and the National Initiative for Cybersecurity Education. Additional research priorities include disaster resilient buildings, sports safety standards, and forensic science.

The House committee declined a significant requested increase and instead gutted NIST’s funding for the National Network for Manufacturing Innovation (NNMI), a multi-agency initiative which seeks to establish public-private manufacturing institutes across the country. Meanwhile, the Senate committee opted to flat-fund the NNMI budget at NIST. In addition to this small discretionary budget, the White House also included \$1.9 billion in mandatory funding in its request to build out NNMI, as it has for several years, but Congress has again declined to act on this funding. While the overall price tag for NNMI remains a bridge too far for Congress, the network’s discretionary funding has fared somewhat better in appropriations elsewhere: DOE has received funding for 1 out of 2 proposed new institutes from both chambers, and DOD also has received funding for two new manufacturing institutes in the House and Senate Defense bills. Elsewhere, the Hollings Manufacturing Extension Partnership would remain funded at last year’s levels in both committees. Flat funding is also slated for NIST’s construction account in the Senate bill, whereas the House committee levied a substantial 58 percent cut.

As for NOAA, appropriators in both chambers sought to limit climate research funding and bolster weather-related programs. The National Weather Service would receive a total \$1.1 billion under the House and Senate bills, both slightly above the request. The two committees also declined a requested increase for climate research in NOAA’s Office of Oceanic and Atmospheric Research (OAR). The House bill would actively cut OAR’s climate research account by \$30 million or 19.0 percent below FY 2016, while the Senate committee would simply impose flat funding, against a considerable 20.2 percent boost requested by the Administration (see table). OAR’s weather and air chemistry research would see a 14.5 percent gain under the House committee’s budget, including \$17 million for



Figures include non-R&D. Inflation is 1.8 percent. © 2016 AAAS

a Joint Technology Transfer Initiative (JTII) to transfer weather research output into operations; the request proposed eliminating JTII and instead sought to establish a Research Transfer Acceleration Program (RTAP), funded at \$10 million, with a more broad focus across OAR programs. The Senate bill also scraps JTII in favor of the new RTAP program, but funds the latter at only \$2 million. Elsewhere, high performance computing initiatives in the OAR office were flat-funded by both the President and appropriators.

Appropriators matched the President’s requested amounts for the major weather satellite programs, the Geostationary Operational Environmental Satellite R-Series (GOES-R) and the Joint Polar Satellite System (JPSS), with both entering a wind-down phase in development costs. GOES-R is set to launch later this year, while JPSS-1 is approaching its launch date in FY 2017. However, appropriators underfunded the planned \$23 million increase for a Polar Follow On satellite, which was budgeted at \$393 million total; the Senate committee offered a \$13 million increase while House funding would remain at last year’s level. The Senate bill also granted \$75 million for new vessel construction at NOAA as part of a multi-year fleet recapitalization effort. The Administration had only provided \$24 million in its discretionary request for this effort, which prompted strong words from Senate appropriators who accused the Administration of a sudden deviation from prior investment plans. Meanwhile, the House committee offered no vessel construction funding.

Environmental R&D (EPA and USGS)

Spending Bill: Interior and Environment (H.R. 5538; S. 3068)

Latest Approvals: House on July 14; Senate Appropriations Committee on June 16

The Interior and Environment bill provides funding for the Department of Interior, including the U.S. Geological Survey (USGS), as well as the Environmental Protection Agency (EPA). USGS and EPA research programs saw moderate increases in the FY 2017 request, only to have their budgets constrained by appropriators thus far. The usual partisan debates over contentious policy riders – including amendments dealing with the Confederate flag that sunk the bill in the past – were limited due to new legislative rules giving GOP leaders the power to limit certain amendments for consideration (thus facilitating the Interior bill’s passage in the full House for the first time since 2009). However, familiar funding battles were waged over the Administration’s priorities on climate

change and the environment, with these programs cut in both the House and Senate.

The President’s budget sought a modest 2.7 percent increase for EPA’s Science & Technology (S&T) account, but the House would instead impose a 2.0 percent cut while the Senate committee adopted an even larger 5.3 percent decrease below FY 2016 (see funding table). Within S&T, the area of greatest divergence is the Air, Climate, and Energy (ACE) Research Program, which was slated for a 10.1 percent boost in the Administration’s request and subsequently targeted for a 3.9 percent reduction in the House and a 10.0 percent drop in the Senate; ACE provides scientific information to support EPA’s goals of protecting and improving air quality and addressing climate change. The House bill also explicitly prohibits ACE funding for the White House’s Mission Innovation Initiative, a commitment between the US and 19 other countries to double clean energy R&D budgets over the next five years.¹⁴ Additionally, both chambers rejected the proposed \$1.5 million increase for EPA

Environmental R&D Appropriations (budget authority in millions of dollars)									
Program / Account*	2015	2016	2017 Pres.	2017 House	Percent Change		2017 Senate	Percent Change	
					Pres.	FY16		Pres.	FY16
EPA Total Budget	8,306	8,140	8,267	7,953	-3.8%	-2.3%	8,109	-1.9%	-0.4%
Science and Technology	729	735	754	720	-4.5%	-2.0%	696	-7.7%	-5.3%
<i>Homeland Security</i>	38	37	37	37	-0.2%	0.0%	37	-1.2%	-1.0%
<i>Air, Climate and Energy</i>	84	92	101	88	-12.7%	-3.9%	83	-18.2%	-10.0%
<i>Safe and Sustainable Water</i>	102	107	106	107	1.1%	0.0%	106	0.0%	-1.1%
<i>Sustainable Communities</i>	138	140	134	134	0.0%	-4.0%	134	0.0%	-4.0%
<i>Chem Safety and Sustain</i>	130	127	134	132	-1.5%	4.2%	126	-6.1%	-0.7%
<i>National Priorities</i>	--	14	--	10	--	-29.1%	5	--	-64.5%
Total EPA R&D Estimate	521	513	512	506	-1.2%	-1.4%	488	-4.6%	-4.9%
USGS Total Budget	1,045	1,062	1,169	1,080	-7.6%	1.7%	1,068	-8.6%	0.6%
<i>Ecosystems</i>	157	160	174	161	-7.6%	0.3%	158	-9.4%	-1.7%
<i>Climate and Land Use Change</i>	136	140	171	146	-14.9%	4.3%	140	-18.1%	0.4%
<i>Energy, Mineral, & Env Health</i>	92	95	99	95	-5.0%	0.0%	95	-5.0%	0.0%
<i>Natural Hazards</i>	135	139	150	143	-4.6%	2.8%	142	-4.9%	2.4%
<i>Water Resources</i>	211	211	228	216	-5.2%	2.6%	211	-7.4%	0.2%
<i>Core Science Systems</i>	107	112	118	114	-3.9%	2.0%	116	-2.0%	4.0%
Total USGS R&D Estimate	666	676	781	723	-7.5%	6.8%	713	-8.8%	5.4%
Total Interior R&D Estimate	864	974	1,076	1,022	-5.0%	4.9%	1,022	-5.0%	4.9%
* Discretionary budgets (includes non-R&D components) Excludes R&D funded through new mandatory proposals in FY 2017. FY 2016 figures are current estimates. Inflation from FY16-17 is 1.8 percent									

¹⁴ See <https://www.whitehouse.gov/the-press-office/2015/11/29/fact-sheet-mission-innovation>

research on the impacts of hydraulic fracturing activities. The House bill maintains funding for water quality and drinking water system research at the FY 2016 level, whereas the Senate committee designated a small cut to match the President's requested level.

The House bill includes additional provisions that would bar funding for carrying out the Administration's Clean Power Plan, which proposes new regulations on greenhouse gas emissions from power plants, as well as efforts to address methane emissions under the Clean Air Act. The Senate bill would prevent EPA from implementing regulations on emissions from livestock producers. Language in both committee reports also directs EPA to conduct government-wide reporting on expenditures for climate change.

USGS would receive an increase from the House to remain about even with inflation in the next fiscal year, while the Senate committee granted slightly less; both amounts fall well short of the request (see table). The Administration had sought a large \$31 million or 22.5 percent increase for the Climate and Land Use Change mission area, about half of which would fund development of the Landsat 9 satellite and accelerate its launch date by two years to 2021. Additional funding would be used to establish a new Climate Science Center focused on the Great Lakes region, among other activities. Congress has so far provided the requested Landsat 9 funding while declining the other parts of the Climate and Land Use Change request.

Congress also underfunded the Ecosystems mission area, under which the agency plans to expand pollinator research and deepen efforts to better understand the sage grouse habitat. Additionally, proposed increases associated with the Administration's WaterSMART program, which focuses on improving water conservation and helping water-resource managers make better decisions about water use, were denied by Senate appropriators. The House and Senate committees did grant some increases for select programs at USGS, including the earthquake early warning system and volcano hazard monitoring stations, reflecting continuing support for these areas.

Appendix: Estimates of Congressional Action on FY 2017 R&D Budgets by Agency (current AAAS estimates of budget authority in millions of nominal dollars)									
	2015	2016	2017 Pres.	2017 House*	Percent Change		2017 Senate*	Percent Change	
					Pres.	FY16		Pres.	FY16
Defense (military)**	66,524	72,237	73,743	73,119	-0.8%	1.2%	73,699	-0.1%	2.0%
<i>S&T (6.1-6.3 + medical)</i>	13,723	15,158	13,324	14,530	9.1%	-4.1%	15,094	13.3%	-0.4%
<i>All Other DOD</i>	52,801	57,079	60,419	58,589	-3.0%	2.6%	58,605	-3.0%	2.7%
Health and Human Services	30,177	31,917	30,914	33,295	7.7%	4.3%	34,014	10.0%	6.6%
<i>Natl Institutes of Health</i>	28,750	30,618	29,592	32,014	8.2%	4.6%	32,780	10.8%	7.1%
<i>All Other HHS</i>	1,427	1,299	1,322	1,281	-3.1%	-1.4%	1,235	-6.6%	-5.0%
Energy	14,385	14,387	16,634	15,675	-5.8%	9.0%	15,757	-5.3%	9.5%
<i>Atomic Energy Defense</i>	6,197	5,726	7,082	7,043	-0.5%	23.0%	6,978	-1.5%	21.9%
<i>Office of Science</i>	5,099	5,305	5,523	5,352	-3.1%	0.9%	5,352	-3.1%	0.9%
<i>Energy Programs</i>	3,089	3,356	4,029	3,280	-18.6%	-2.3%	3,427	-15.0%	2.1%
NASA	11,413	13,273	12,170	13,368	9.8%	0.7%	13,179	8.3%	-0.7%
National Science Foundation	5,990	6,117	6,160	5,929	-3.8%	-3.1%	6,088	-1.2%	-0.5%
Agriculture	2,454	2,674	2,598	2,581	-0.7%	-3.5%	2,567	-1.2%	-4.0%
Commerce	1,527	1,904	1,879	1,669	-11.2%	-12.4%	1,814	-3.4%	-4.7%
<i>NOAA</i>	692	805	810	731	-9.7%	-9.2%	777	-4.1%	-3.5%
<i>NIST</i>	669	773	806	702	-12.9%	-9.1%	794	-1.5%	2.7%
Transportation	887	924	866	844	-2.5%	-8.6%	850	-1.9%	-8.1%
Homeland Security	919	579	585	591	1.0%	2.1%	630	7.6%	8.8%
Veterans Affairs	1,178	1,220	1,252	1,252	0.0%	2.6%	1,275	1.8%	4.5%
Interior	864	974	1,076	1,022	-5.0%	4.9%	1,022	-5.0%	4.9%
<i>US Geological Survey</i>	665	683	787	723	-8.2%	5.8%	713	-9.5%	4.3%
Environ Protection Agency	521	513	512	506	-1.2%	-1.4%	488	-4.6%	-4.9%
All Other	1,491	1,585	1,737	1,567	-9.8%	-1.2%	1,628	-6.3%	2.7%
Total R&D (excl. Ebola)	138,328	148,305	150,126	151,417	0.9%	2.1%	153,011	1.9%	3.2%
Defense R&D	72,721	77,963	80,825	80,162	-0.8%	2.8%	80,678	-0.2%	3.5%
Nondefense R&D	65,607	70,343	69,302	71,255	2.8%	1.3%	72,333	4.4%	2.8%
By Character									
Basic Research	31,909	33,510	32,791	34,241	4.4%	2.2%	34,634	5.6%	3.4%
Applied Research	36,101	37,794	37,511	38,623	3.0%	2.2%	39,392	5.0%	4.2%
Development	68,081	75,120	76,829	76,170	-0.9%	1.4%	76,330	-0.6%	1.6%
Facilities & Equipment	2,453	2,574	2,634	2,428	-7.8%	-5.7%	2,654	0.8%	3.1%
<p>*Most figures refer to committee bills, as few spending bills have achieved floor passage. **Includes Overseas Contingency Operation funding Excludes R&D funded through new mandatory proposals in FY 2017. FY 2016 figures are current estimates. Inflation from FY16-17 is 1.8 percent</p>									