

2 – Agency R&D Budgets

(Full agency analyses of R&D in FY 2005 appropriations, including historical charts and supplemental material, are available on the AAAS R&D web site.)

Department of Defense (DOD)

The final FY 2005 Department of Defense (DOD) budget contains DOD \$70.3 billion for its R&D programs, an increase of 7.1 percent or \$4.6 billion that gives DOD its largest R&D budget in history, following substantial increases in each of the past four years (see Table 4).

DOD support of basic and applied research will increase substantially in FY 2005. In the DOD request released in February 2004, DOD's "6.1" (basic research) and "6.2" (applied research) activities combined would have fallen 10.6 percent to \$5.2 billion. But the final appropriation adds funds to both categories to provide a total of \$6.3 billion for DOD "6.1" plus "6.2", a boost of 8.7 percent over FY 2004.

Basic research funding (the "6.1" category) rises \$85 million to \$1.5 billion in FY 2005, in contrast to a steep requested cut. Last year, funding for the University Research Initiatives (URI) program switched from the Office of the Secretary of Defense (OSD) to the three services. URI competitively awards basic research grants to university performers; in FY 2005, DOD will continue URI in the three services at a combined level of \$302 million, up \$19 million from this year. The broader Defense Research Sciences programs, which fund research at DOD laboratories, universities, and other performers, will collectively total \$952 million, up substantially from \$884 million in FY 2004.

Applied research funding (the "6.2" category) climbs 9.5 percent or \$420 million to \$4.8 billion in FY 2005, instead of a requested cut. Again, applied research in each of the three services and the Defense Agencies will increase. Applied research in the Defense Agencies will increase 10.0 percent because of jumps in Defense Advanced Research Projects Agency (DARPA) funding (see DARPA, below).

Applied research on medical topics also increases, to a new high of \$507 million in FY 2005. Since the early 1990s, Congress has appropriated funds for congressionally designated medical research programs in the DOD budget. In the past, nearly all of these funds were appropriated in the Army, but in FY 2000 Congress began to appropriate the majority of them outside the RDT&E accounts in the Defense Health Program (see Table 4). The FY 2005 total of \$507 million for medical research includes \$150 million for breast cancer research, \$85 million for prostate cancer research, and \$10 million for ovarian cancer research in peer-reviewed, competitively awarded grants, the same as last year. There is also \$50 million for peer-reviewed research on other medical topics. Earmarked medical research projects make up most of the remaining medical research appropriation.

DOD funding of "S&T" (the "6.1" through "6.3" categories plus medical research) climbs to \$13.6 billion in FY 2005, an increase of \$993 million or 7.9 percent (see Table 4). For the past several years, Congress has been more supportive of S&T funding than the Pentagon, and the pattern holds true again in the FY 2005 budget. The final congressional appropriation is nearly \$3 billion more than the \$10.6 billion DOD request. Advocates of DOD S&T in the science and engineering community argue that DOD S&T funding is essential for building the knowledge and technology base for future DOD needs, and have successfully argued that post-Cold War cutbacks over the past decade eroded this base. In the past few years, there has been growing support inside and outside the Pentagon for setting 3 percent of the DOD budget as a goal for the proper level of S&T investment. The last three budgets, including this year's, have met that goal after taking out Iraq and Afghanistan war spending. The FY 2005 request would have cut S&T funding steeply, lowering the S&T/budget ratio to 2.64 percent; the final Defense bill puts the S&T/budget ratio at 3.38 percent.

DOD S&T will reach its highest funding level ever in FY 2005. Although DOD S&T approached \$13 billion in today's dollars during the height of the Cold War in the late 1980s, DOD S&T hit post-Cold War lows of just above \$8 billion in today's dollars in the late 1990s (see Figure 3). But in recent years, congressional appropriators have provided steady increases, and the FY 2005 budget carries DOD S&T investments above \$13 billion for the first time. While this is a relief for DOD S&T advocates, the composition of the DOD S&T portfolio has been changing. DOD support of basic research has increased relatively little, and is a shrinking proportion of the DOD S&T portfolio. While "6.2" funding has increased a little more, recent growth in DOD S&T has come predominantly from growth in "6.3" funding of advanced technology development rather than from research.

R&D in the Defense Agencies will increase \$1.6 billion to \$20.5 billion, primarily because of a \$1.2 billion increase to \$8.8 billion for development in the Missile Defense Agency (MDA; see Table 5). The missile defense program is a high priority for the Bush Administration and Congress. While Congress ends up providing less than the \$9.1 billion MDA requested, the appropriation will still be a substantial 15.8 percent increase over FY 2004. The MDA (formerly the Ballistic Missile Defense Organization) no longer funds research; there would be some funds for technology development but now nearly all missile defense funds go to advanced development, testing, manufacturing development, and evaluation of missile defense systems. MDA is gearing up for initial deployment in winter 2004-05 of national missile defense systems.

The Defense Advanced Research Projects Agency (DARPA) sees its R&D funding increase by 4.9 percent to \$3.0 billion, slightly off the \$3.1 billion request. The final Defense bill follows an earlier Senate lead in criticizing several DARPA programs for being too large to manage effectively. But instead of cutting funding, the Defense bill splits four large programs making up half the DARPA budget (in computing systems and communications, materials and electronics, aerospace and space, and sensor and guidance systems) into eight smaller ones to give each new program a smaller research focus area; the combined budgets of the eight new programs are well above current-year funding for the four larger programs. The biggest boost to DARPA will be for its basic research "6.1" program in Defense Research Sciences, which will climb 23 percent to \$171 million.

National Institutes of Health (NIH)

NIH and the NIH community are still adjusting to diminished expectations after years of favored treatment. After a completed five-year doubling campaign involving 15 percent increases for each of the five years between 1998 and 2003, biomedical researchers hoped for a 'soft landing' in following years, or a gradual easing into slower growth rates. Instead, growth has slowed dramatically. NIH enjoyed steady budget growth over the past several decades, but growth accelerated sharply after FY 1998 and continued to FY 2003 during the five-year NIH doubling campaign. But then growth slowed down to just ahead of the inflation rate in FY 2004, and slows down even further in FY 2005.

NIH has a total budget of \$28.6 billion in FY 2005, a \$573 million or 2.0 percent boost over last year that falls short of the NIH request by \$156 million (see Table 8). NIH classifies 97 percent of its budget as R&D, including R&D facilities (the remainder is for overhead costs and research training). The final budget contains \$27.8 billion for NIH R&D, also a 2.0 percent increase over last year but 0.5 percent short of the request. Most NIH institutes receive increases in a narrow range between 1.6 and 2.5 percent within the tight overall funding environment.

The final appropriation, because it falls short of earlier NIH plans for FY 2005, could cause NIH to fall short in its plans to allow research projects grants (RPG) funding to increase. The majority of NIH's budget is distributed to external performers through Research Project Grants (RPGs), which are investigator initiated, peer reviewed, and competitively awarded. In February 2004, NIH estimated that the request would support a record 37,744 RPGs, an increase of 515 awards over FY 2004 (up 1.4 percent).

The final appropriation, falling 0.5 percent short of the request, will likely result in fewer grants than previously estimated.

The success rate for new grant applications could dip below 27 percent in FY 2005, down from a high of 32 percent in FY 2001 and the lowest since FY 1995 because of recent surges in the number of applications outpacing the number of grants awarded. Although the number of RPGs has increased from 25,000 in the early '90s to more than 35,000, the number of grant applications has increased so fast that the success rate is now well below the success rates of the NIH doubling period 1998-2003 when they exceeded 30 percent.

NIH will fund \$297 million in R&D facilities and capital equipment in FY 2005, up 32 percent from last year but a sharp drop from \$1.1 billion the year before. Much of this funding comes from the Buildings and Facilities account, which increases 11 percent to \$110 million in FY 2005; in 2003, this account was \$639 million because of a major investment in biodefense facilities construction. The B&F appropriation funds intramural construction at NIH facilities, while in the NIAID budget there is \$149 million allocated for extramural construction grants to build an additional 20 extramural biosafety (level 3) laboratories around the nation.

NIH will soon put into place a plan to allow public access to scientific journal articles resulting from NIH-funded research within six months of publication. In summer 2004, the report accompanying the House Labor-HHS bill included nonbinding language calling on NIH to outline a policy by December 2004 to allow public access to all NIH-funded research results. In response, NIH published a notice announcing a draft policy for public comment that would respond to the report language, and accepted comments on the draft until November. The omnibus appropriations bill contains language supporting the earlier House language and calling for NIH to take into account the public comments in formulating a final policy. The draft policy would require that “grantees and supported Principal Investigators provide the NIH with electronic copies of all final version manuscripts upon acceptance for publication if the research was supported in whole or in part by NIH funding.” NIH would then archive the manuscript in its PubMed Central database six months after publication, making it freely available to the public. NIH is expected to finalize the details of this policy in late December 2004, with only minor changes to the draft.

Congress approved the funds necessary for NIH to carry out an expanded Roadmap for Medical Research. Last year, NIH Director Elias Zerhouni introduced a Roadmap for Medical Research involving all the NIH institutes and centers and aimed at three areas of NIH research: improving clinical research (dubbed “Re-engineering the Clinical Research Enterprise”), encouraging interdisciplinary research (“Research Teams of the Future”), and providing new knowledge and research tools to assist other researchers (“New Pathways to Discovery”). Congress approved \$12 million in the Office of the Director (OD) to begin the Roadmap, but with contributions from the other ICs and other OD funds total Roadmap funding was \$128 million last year. Total Roadmap funding will nearly double to \$237 million in FY 2005 with \$60 million coming from OD and the remainder coming from a tap of up to 0.63 percent of the other institutes’ FY 2005 budgets.

Total R&D in the Department of Health and Human Services (HHS) will be \$29.1 billion in FY 2005, an increase of 2.2 percent driven primarily by the NIH budget (see Table 9). Among the other HHS agencies, R&D in the Food and Drug Administration (FDA) increases by 14.3 percent to \$154 million, in part to boost the FDA’s laboratory and science capabilities in food safety. R&D in the Office of the Secretary will surge dramatically by 21.5 percent to \$148 million, most of which will be transferred to other HHS agencies such as NIH for medical countermeasures and the Centers for Disease Control and Prevention (CDC) for anthrax vaccine research and biosurveillance R&D. Finally, R&D in the Health Resources and Service Administration (HRSA) more than quadruples to \$101 million because of nearly \$80 million in R&D earmarks, mostly for laboratory construction projects in university medical schools and teaching hospitals around the country.

National Science Foundation (NSF)

The National Science Foundation (NSF) budget falls in FY 2005 down to \$5.5 billion, \$105 million or 1.9 percent less than last year and \$272 million less than the request for the first NSF budget cut since 1996 (see Table 10). Most research directorates see their budgets fall between 1.5 and 2.0 percent. The NSF budget of \$5.5 billion would be far short of the \$7.4 billion FY 2005 authorization signed into law 19 months ago as part of a plan to double the NSF budget in the five years to FY 2007, and could permanently end any hopes of achieving the doubling. NSF's R&D funding totals \$4.1 billion in FY 2005, a cut of 0.3 percent.

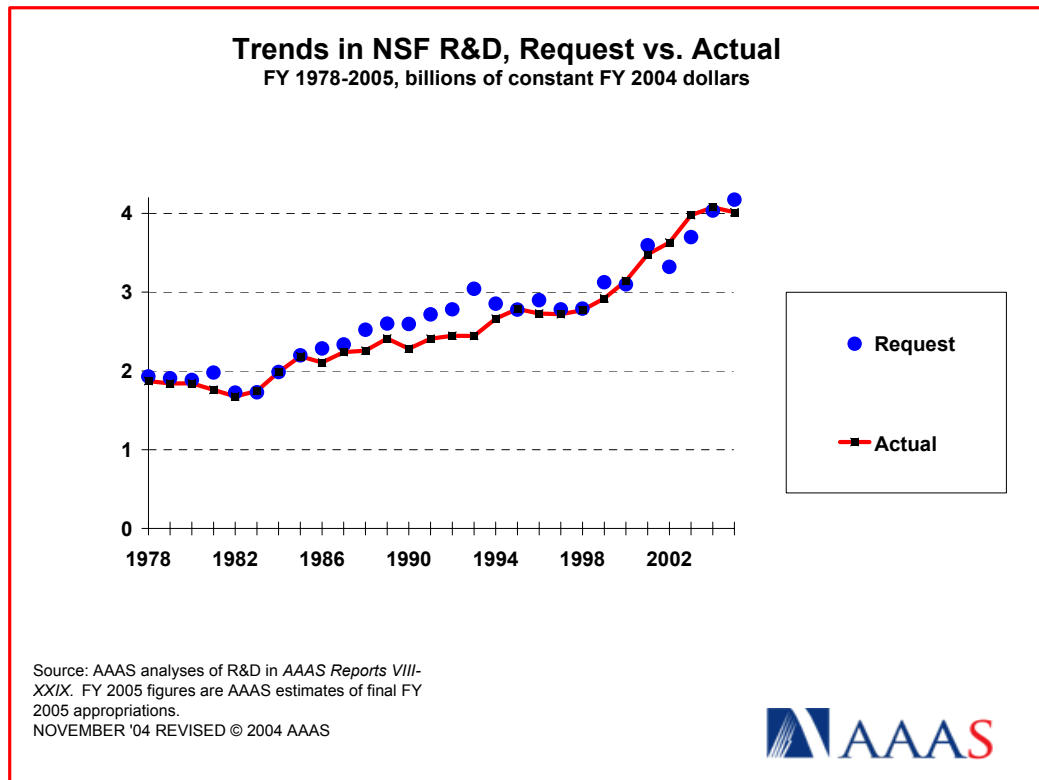


Figure 7.

Congress decided to cut the **Research and Related Activities (R&RA)** account, which funds most of NSF's R&D. R&RA funding falls \$31 million or 0.7 percent down to \$4.2 billion, \$152 million short of the modest requested increase.

Outside NSF's R&D activities, Congress rejected the Administration proposal to transfer the Math and Science Partnerships (MSP) from Education and Human Resources (E.H.R.) to the Integrative Activities (IA) account. Congress keeps the Partnerships in E.H.R. at a level of \$80 million, down substantially from \$139 million this year but the same as the request. The MSP program, run jointly by NSF and the Department of Education (ED), encourages academic institutions and schools to work together to improve math and science education. In the omnibus bill, Congress agrees with the Bush Administration's desire to shift the emphasis of the program toward ED, even as it keeps the NSF share in E.H.R. The FY 2005 omnibus provides \$180 million for the Department of Education's share of the program, up from \$149 million this year. Combined, the MSP programs receive \$260 million in FY 2005, down from \$288 million last year.

NSF's Education and Human Resources (EHR) programs receive \$841 million, down more than 10 percent from last year. Most of the decline is due to the shift in MSP funding to the Department of Education. The final FY 2005 appropriation contains \$94 million for the Experimental Program to Stimulate Competitive Research (EPSCoR), the same level as last year. EPSCoR assists research institutions and states that have traditionally been underrepresented in federal R&D funding to build research capacity. The program is currently open to 25 states, Puerto Rico, and the U.S. Virgin Islands. Collectively, the 25 NSF EPSCoR states (and Puerto Rico) received 11.5 percent of NSF's R&D portfolio in FY 2002, far less than California alone.

The one increase in the final FY 2005 NSF budget goes to NSF's support of R&D facilities. NSF receives \$174 million for the Major Research Equipment and Facilities Construction (MREFC) account, up from \$155 million last year though well short of the \$213 million request. Congress agreed to two of the three proposed starts (the Scientific Ocean Drilling Vessel and Rare Symmetry Violating Processes (RSVP)), with the other proposed start (the National Ecological Observatory Network (NEON)) a casualty of tight budget constraints. Congress keeps planning and design for NEON alive in the R&RA account at \$6 million in anticipation of future MREFC funding. Congress boosts funding for the IceCube Neutrino Detector Observatory from \$42 million this year to \$48 million in FY 2005 in order to accelerate the timetable for this project at the South Pole. EarthScope (\$47 million) and the Atacama Large Millimeter Array (\$49 million) are the other two projects to receive MREFC funds in FY 2005.

The approved cuts to most of the research directorates would seriously squeeze NSF funding of competitively awarded research grants. Even with the requested increase for NSF proposed by the Bush Administration in February, NSF estimated that the success rate for research grant applications would dip to 23 percent in FY 2005, down one percentage point from the past few years. Among some directorates, the odds of success would be even lower. The final FY 2005 appropriation would almost certainly lead to far lower success rates in FY 2005 grant competitions.

NSF has enjoyed mostly steady budget growth over the past 15 years, as shown in Figure 7. After declines in the mid-1990s in the push toward a balanced budget, growth resumed after FY 1998 and momentum began to build to double the NSF budget over five years, culminating in the NSF authorization bill of December 2002. But NSF budget growth slowed down to just ahead of the inflation rate in FY 2004, and reverses in the final FY 2005 budget. Recent budgets have put NSF further and further behind the authorized doubling path and have created downward pressures on NSF grant sizes and success rates.

National Aeronautics and Space Administration (NASA)

The National Aeronautics and Space Administration (NASA) emerged as one of the winners in the FY 2005 budget process with a \$16.1 billion total budget in FY 2005, 4.5 percent more than last year. The budget allows NASA to embark on an ambitious plan to send humans back to the Moon and onward to Mars (see Table 6).

Most of NASA's budget increase, however, goes to the more immediate priorities of returning the Space Shuttle to flight in spring 2005 and using the Shuttle to resume construction of the International Space Station. NASA R&D, which excludes the Shuttle, rises at a modest 2.0 percent rate to \$11.1 billion (see Table 6). The R&D increases allow NASA to initiate development of new technologies for the moon-and-Mars missions, to plan for a repair mission to the Hubble Space Telescope, and to resume construction of the International Space Station. Exact figures for NASA's programs are provisional estimates, however, because the omnibus bill allows NASA almost unlimited flexibility to transfer funds between accounts in order to address NASA's many competing needs in the coming year; already, it is nearly certain that NASA R&D will be less than the estimate because of the near certainty that Space Shuttle costs in FY 2005 will far exceed the \$4.3 billion requested and approved in the FY 2005 budget.

With the January 2004 presidential announcement of plans to send humans to the moon again on the way to Mars, the National Aeronautics and Space Administration (NASA) was supposed to embark on a new era in its history, with a major commitment of new resources to enable the agency to begin preparing for a new lunar mission. After rough sledding for most of 2004 before a skeptical Congress, the final FY 2005 budget surprised observers by keeping NASA's plans on track, though with some modifications.

Congress trimmed the \$1.9 billion request for the Space Station slightly to \$1.8 billion, which is still 19.5 percent more than FY 2004 spending for a substantial increase. With the original deadline of February 2004 for completion of the core station long shattered, the Station is now essentially in maintenance mode of two astronauts supplied by Russian spacecraft, with construction activities in limbo indefinitely until the Space Shuttle resumes its role of carrying Station components into orbit. The FY 2005 budget envisions Space Station construction getting back in high gear after the Shuttle returns to flight, though the flexibility NASA receives in the omnibus bill will allow for the funds to be transferred to other programs if Shuttle delays once again result in further Space Station delays, or to the Shuttle program itself.

With these two big-ticket current programs provided for, the final FY 2005 budget also provide funds and a ringing endorsement of plans to start new moon-and-Mars related programs, especially within the Exploration Systems (ES) account. NASA could have up to \$428 million to begin development of the Crew Exploration Vehicle (CEV), a project to develop a next-generation spacecraft capable of taking humans beyond low-Earth orbit. The CEV project is designed to replace the Space Launch Initiative, another program to develop next-generation space launch vehicles. NASA receives \$1.1 billion for the Human and Robotic Technology (HRT) program, up 64 percent from comparable programs in FY 2004. The large boost is due to an allocation of up to \$438 million for Project Prometheus to develop new power and propulsion technologies based on nuclear power for future NASA missions, a key need if NASA is to launch spacecraft to the Moon and beyond.

The Exploration, Science, and Aeronautics (ESA) account, which funds most of NASA's research, is battered with a reduction to \$7.7 billion, down 1.9 percent from FY 2004 in a year when the Space Shuttle, Space Station, and new space exploration technologies are higher priorities (see Table 6). The ESA appropriation could be headed even lower if ballooning Shuttle costs require transfers to that program from ESA accounts.

The Space Science program sees its budget rise modestly by \$21 million or 0.5 percent to \$4.0 billion, but \$291 million of the final appropriation goes to fund a previously unbudgeted servicing mission to the Hubble. NASA has attracted strong criticism this year for canceling a previously planned shuttle servicing mission to extend the life of the Hubble, instead focusing on robotic servicing. The House urged NASA to keep alive the option of a shuttle mission for Hubble, but did not provide any additional funds beyond the \$130 million request for the overall Hubble program (down sharply from \$241 million this year), which would not have paid for a mission. The Senate provided core Hubble funding plus \$300 million in dedicated funding for a servicing mission after the Shuttle eventually returns to flight. The final omnibus bill allocates \$291 million in the regular Space Science budget for a mission, but leaves NASA with the burden of finding the money from other NASA programs.

Outside of Space Science, most of NASA's research-oriented programs face cuts. The Earth Science program falls 6.7 percent to \$1.5 billion in FY 2005, confirming the lower priority assigned to space-based observations of the Earth within NASA's portfolio of activities. Congress cut Aeronautics funding by 10.1 percent to \$930 million, similar to NASA's own plans. NASA's Education Programs funding falls 5.7 percent to \$213 million, despite congressional boosts for the National Space Grant College and Fellowship program (to \$28 million) and for the EPSCoR program (to \$12 million). At the same time, Congress added \$172 million to the ESA budget for congressional earmarks, further squeezing the shrinking resources for these programs.

As a result, **NASA may have to make deep cuts in its research portfolio.** AAAS estimates that NASA support of research could fall 5.5 percent to \$5.3 billion (see Table 2), even as funding for development (technologies for the moon-and-Mars mission) and R&D facilities (the International Space Station) increase substantially. These cuts could go even deeper if the Space Shuttle gets more expensive in 2005.

The modest increase to NASA's R&D portfolio in FY 2005 would continue a modest upward trend for the past several years. NASA's R&D funding has barely kept pace with inflation going back to FY 1991, and recent increases have been just barely ahead of inflation. Although the Bush Administration's moon and Mars plan promised new development efforts and increasing resources in a time of fiscal austerity, a closer look at the final FY 2005 budget shows that most of the money would come from reprogramming from other NASA programs rather than large funding increases in FY 2005 and later. Indeed, NASA has promised repeatedly over the past year that it could accomplish its ambitious goals over the next decades with a budget just keeping pace with expected inflation. With a return to the moon nearly twenty years away and a possible trip to Mars nearly three decades away, the presidential announcement and the apparently good FY 2005 omnibus bill did little to change NASA's near-term budget prospects for R&D, especially since the bulk of the budget increases go to more immediate priorities in the Shuttle and Station.

Department of Energy (DOE)

DOE's R&D budget rises 1.7 percent to \$9.0 billion in FY 2005 (see Table 7). DOE wound up lucky this year because there was some doubt until the last minute whether the Energy-Water bill, which funds most of DOE, would make it into the omnibus bill; the Senate had never even drafted its version of it, and the entire bill was stuck in a protracted dispute over funding the Yucca Mountain waste depository. But just two days before the omnibus was finalized, Energy-Water bill was rolled into the bill. The alternative was to fund DOE at FY 2004 levels for all of FY 2005.

R&D in DOE's Office of Science (OS) programs emerged a big winner, with increases going to most OS programs. Although the Administration proposed declining funding at \$3.2 billion for the fourth year in a row, Congress added \$152 million to the request for a total of \$3.3 billion in R&D for FY 2005, a 4.3 percent boost compared to last year. The final appropriation contains \$78 million in congressionally designated projects (earmarks) that were not in the request, but this compares to \$95 million in FY 2004 earmarks, so the Office of Science actually has even more funds to devote to its core R&D programs in FY 2005.

The funding boost should allow major OS research programs to increase operating time and user support at scientific user facilities. The Office of Science operates unique, large-scale research facilities at DOE's national laboratories around the country, which external researchers can use for their own experiments through a competitive proposal process. In recent years, tight budgets have squeezed operating time at these facilities. Funding for the largest OS account, Basic Energy Sciences, increases \$96 million to \$1.1 billion, at the same time that construction costs of the Spallation Neutron Source, a new large-scale facility in Tennessee, decline. As a result, BES support of research grants and user time at existing facilities should increase substantially in FY 2005, especially in the area of nanoscale science.

In addition to its support of facilities, DOE's Office of Science is also the dominant federal supporter of research in the physical sciences, particularly high-energy physics and nuclear physics. Both physics programs increase slightly in FY 2005. It is also a leading supporter of biological sciences, environmental sciences, computing sciences, and fusion research.

Congress provides additional funds to the Fusion Energy Sciences program to ensure that U.S. participation in an international fusion project will not crowd out domestic research. The Fusion appropriation of \$274 million is \$11 million more than last year and \$10 million more than the request. The

additional funds would go to increase user time at domestic fusion experimental facilities. Congress also urges DOE to support additional domestic fusion research with funds freed up by delays in the International Thermonuclear Experimental Reactor (ITER). The \$5 billion international project has been delayed because the international partners have been unable to agree on a site in either Japan or France; a year after a deadline to pick a site has come and gone, the six partners are still deadlocked.

The largest Office of Science increase goes to Advanced Scientific Computing Research (ASCR), whose funding jumps 14.9 percent to \$232 million in contrast to a flat request. The additional funds would help develop hardware, software, and algorithms necessary for world-leading research supercomputing capabilities. There has been increasing congressional concern that the U.S. is losing its lead in high-performance research computing, especially to Japan. Just a few weeks ago, the President signed into law an authorization bill (Public Law 108-423) that would give a higher profile to DOE's high performance computing activities and would establish a specific DOE R&D program in ASCR to develop more advanced research supercomputing user facilities.

Congress approved a 2.6 percent cut to DOE's energy-related R&D for a total of \$1.3 billion, but awarded big increases for selected energy programs. The overall Solar and Renewables R&D program increases to \$325 million in FY 2005; Congress agreed to the Administration's requested increase for hydrogen-related research to \$95 million. Nuclear energy R&D surges 31 percent to \$171 million in contrast to a requested cut.

Fossil Energy R&D falls 18.9 percent to \$377 million because Congress denied the Administration's \$237 million request for the FutureGen program, offering only \$18 million. FutureGen is an initiative aimed at building an integrated, near-emission-free electricity and hydrogen production plant and began with \$9 million in FY 2004. Congress used some of the funds freed up by the FutureGen reductions to boost funding for other programs, but not enough to keep overall Fossil Energy R&D from falling steeply. The separate Clean Coal power initiative received \$50 million, far below the \$170 million FY 2004 funding level. But Advanced Research increases to \$43 million, a small boost instead of the 20 percent cuts requested by the President, and distributed generation systems aimed at fuel cell research received \$78 million, more than triple the requested amount.

DOE has responsibility for managing and disposing of the nation's spent nuclear fuel and high-level radioactive waste, both civilian and military. In past years, Waste Management R&D represented a small part of the DOE's portfolio. However, as the Yucca Mountain long-term, high-level nuclear waste repository moves forward after receiving congressional and White House approvals a year ago, the FY 2005 request would have quadrupled the budget for radioactive waste management R&D to \$275 million, funded by the proposed transfer of nuclear power funds out of a trust fund. In last-minute negotiations over the omnibus bill, Congress did not agree to the trust fund transfer and had to find Yucca Mountain funding from other DOE programs, resulting in a boost to Yucca Mountain but not as high as requested. Yucca Mountain-related R&D received \$127 million, half the request but nearly double last year's funding level.

On the defense side, most of DOE's R&D is funded by the National Nuclear Security Administration (NNSA), which funds maintenance of the nation's nuclear weapons stockpile through science-based research, mostly in its core Weapons Activities account. R&D in Weapons Activities has grown substantially in recent years in lockstep with rapid growth in overall defense spending, from \$2.4 billion in FY 2001 to \$3.2 billion last year, but slows down to a 0.9 percent increase to \$3.2 billion in the FY 2005 budget. Within the overall portfolio, Inertial Confinement Fusion R&D funding rises 4.4 percent to \$537 million, including \$129 million for continued construction of the National Ignition Facility at the Lawrence Livermore National Laboratory in California. DOE's considerable investments in research computing on the defense side of the budget continue at \$698 million, down 3.2 percent from last year but still nearly triple the ASCR investment on the nondefense side.

This year, there was again considerable controversy over the **Bush Administration's proposal to initiate research on a new generation of nuclear weapons**, including the Robust Nuclear Earth Penetrator (RNEP) project (nicknamed a 'bunker buster' bomb) and other tactical or 'low-yield' nuclear weapons. The President requested \$28 million in FY 2005 for continued R&D on the RNEP project and \$9 million for similar concept studies, but the omnibus bill specifically zeroes out funding for both programs. Last year, President Bush signed into law a defense authorization bill which repealed the longstanding U.S. prohibition on research and development of low-yield nuclear weapons, thus allowing this research program to take place, but prohibited DOE from entering the development phase of the RNEP or other tactical nuclear weapons unless it receives explicit authorization from Congress. Congress has repeatedly criticized DOE for continuing to claim that the RNEP is only a research program, while at the same time projecting \$485 million in its budget over the next five years, an investment more than sufficient to move the program well into design and development toward eventual production.

Department of Homeland Security (DHS)

The still-new DHS has \$1.2 billion for its R&D portfolio in FY 2005, a dramatic increase of \$206 million or 19.9 percent over FY 2004 following an even larger \$300 million increase the previous year (see Table 16). The nearly 20 percent boost for DHS is the largest percentage increase of an agency's R&D portfolio in FY 2005.

Most DHS R&D programs have their home in the Directorate of Science and Technology (S&T), one of five broad directorates in the new department. In FY 2005, the S&T Directorate will fund more than 80 percent of all DHS R&D (see Table 16). Nearly all of the \$1.1 billion total S&T Directorate budget will go toward R&D activities, except for \$69 million in administrative and other overhead costs.

Congress added \$60 million to the DHS request for S&T's R&D programs in four specific program areas. Congress provided \$70 million for University Programs and Fellowship Programs, a boost of \$40 million over the request and the same amount as last year. This program funds several university-based centers of excellence and is a funding source dedicated exclusively to funding university-based research. The Department expects to designate several university-based centers for homeland security in FY 2005, adding to the three centers that have already been announced (one on threat assessments and two on agro-terrorism). Universities will not be limited to just \$70 million; they will also be able to compete for R&D funds in the other program areas. This program also funds fellowships that will bring scientists and engineers from academia and private industry to work within the DHS for a year or two, and funds graduate fellowships for students seeking careers in technical areas related to homeland security. Congress also added \$10 million in new funds for the Safety Act (included in "Other" in the Table), funds that would be used to certify products as "qualified homeland security technologies" and thus protected from potential liability, in the hopes of encouraging their rapid deployment. Congress added \$21 million in new funds for Interoperability in Communications (see "Other" in the Table) to fund R&D in next-generation communications technologies for public safety wireless communications interoperability. Finally, there are \$10 million in new funds for a container security initiative (included in "Conventional Missions" in the Table) to develop new technologies for detecting biological, chemical, radiological, explosive, or nuclear materials in shipping containers.

The largest R&D increase goes to biological countermeasures with an appropriation of \$363 million, nearly double last year's funding. In addition, there was a separate \$87 million last year and \$35 million in FY 2005 for construction of a new laboratory named the National Biodefense Analysis and Countermeasures Center in Fort Detrick, Maryland. Adding in this biodefense laboratory, it becomes clear that biological threats are the top priority in the DHS R&D portfolio, accounting for nearly a third of all DHS R&D.

In other areas, Congress stuck closely to the request but moved some funds to new accounts. DHS will spend \$61 million for R&D on antimissile devices for commercial aircraft, in the hopes of developing and prototyping antimissile devices that can be fitted on airplanes (up from \$60 million last year, funded through the Critical Infrastructure program). These devices would counter the potential threat from MANPADS (man-portable air defense systems), shoulder-fired missiles that have been used (unsuccessfully so far) against passenger aircraft.

In addition to its R&D funding, **DHS also has \$5.6 billion over the next 10 years to procure biodefense countermeasures from the private sector**, which could provide strong incentives for private-sector investments in biodefense R&D. The FY 2004 DHS appropriation provided \$885 million in FY 2004 and an additional \$4.7 billion between 2005 and 2013 for the program named Project BioShield in the President's State of the Union address. \$2.5 billion of this money became available at the October 1 start of FY 2005 without any further action by Congress, but spending authority and management for the program transferred to the Department of Health and Human Services (HHS) with the enactment of the Project Bioshield authorization law in July 2004. Although not an R&D program, the program is designed to encourage private-sector R&D investments in biodefense vaccines, therapeutics, and other countermeasures by providing a guaranteed government market for future products. HHS will use Bioshield funds to purchase countermeasures for the Strategic National Stockpile (SNS), which also transferred to HHS from DHS in summer 2004. HHS awarded the first BioShield contract in October 2004 to VaxGen for 75 million doses of an experimental anthrax vaccine that is still in development, at a price tag of \$877 million.

U.S. Department of Agriculture (USDA)

In contrast to a requested cut of 3.5 percent down to \$2.2 billion, Congress funded USDA R&D at \$2.4 billion, a 7.8 percent increase (see Table 12). Most of the increase goes to laboratory construction projects, leaving basic and applied research up a smaller 2.5 percent. Congress provides \$122 million in new funds, down from the requested \$178 million, for animal research and diagnostic facilities at the National Centers for Animal Health in Ames, Iowa. The remaining construction funds go to earmarked projects.

USDA's extramural research grants, nearly entirely to colleges and universities, are administered by the Cooperative State Research, Education and Extension Service (CSREES). Total CSREES R&D will be \$643 million in FY 2005, a 4.0 percent or \$24 million increase over FY 2004 but a substantial \$132 million more than the request. The difference comes from the insertion of \$148 million in congressional earmarks that the Administration proposed to terminate. Congress allocated \$120 million for Special Research Grants, up from \$111 million last year. This program has traditionally been home to congressionally designated, performer-specific research projects. The omnibus bill lists 196 itemized projects for specific performers, most of which were also earmarked for funding in FY 2004.

At the same time, the National Research Initiative (NRI) program of competitively awarded agricultural research grants receives a record \$180 million, the same as the request and \$16 million more than last year. Congress also set aside \$43 million for competitive grants within the Integrated Grants program. USDA also provides formula funds for agricultural R&D to qualifying institutions in programs such as the Hatch Act, which sees a slight decline in funding to \$179 million in FY 2005.

The FY 2005 increase for R&D brings the USDA R&D portfolio to an all-time peak in inflation-adjusted dollars. USDA R&D has been at historical highs for the past few years. Since hitting a recent low in FY 1996, the funding trend has been generally upward, first because the federal budget surplus made more discretionary funds available to congressional appropriators, then in FY 2000 and FY 2001 from the release of mandatory competitive research funds, and then since FY 2002 because heightened concern

about agricultural terrorism and the security of USDA laboratories resulted in millions for security upgrades and other homeland security-related investments.

Department of Commerce

Once again, Congress saved the Advanced Technology Program (ATP) within the Department of Commerce in FY 2005, although with a sharply reduced budget. Although the House has voted repeatedly to eliminate the program in previous years, the program has been saved every year by the Senate. In February, the Bush Administration proposed to eliminate ATP for the third time in the last four years; the House went along with the latest proposal but the Senate approved a large increase. The Senate prevails in the final omnibus bill, but the ATP budget of \$136 million is 24 percent below last year's funding level and may not be enough for ATP to award new grants in FY 2005, only to pay continuing costs of already-awarded grants. Most of the ATP budget is for R&D activities.

Elsewhere in the Commerce budget, the National Institute of Standards and Technology's (NIST) intramural laboratory R&D programs do well in FY 2005 with a 16.2 percent increase to \$328 million (see Table 11). Last year, the Administration requested a similar increase for the NIST laboratories and the elimination of ATP. Congress saved the ATP but found the money by cutting NIST's intramural R&D nearly 10 percent. In FY 2004, these cuts led to announcements of forced early retirements and layoffs of NIST scientists. But the omnibus bill provides sufficient funds to avoid such tough choices in FY 2005. The non-R&D Manufacturing Extension Partnership in NIST received \$108 million, nearly triple last year's funding level but roughly equal to the FY 2003 and earlier years' budgets.

Congress responded to the recent U.S. Commission on Ocean Policy report by dramatically boosting National Oceanic and Atmospheric Administration (NOAA) funding of ocean-related research, and created a new NOAA scholarship program to encourage U.S. citizens to study oceanic and atmospheric science. NOAA R&D climbs 10.7 percent to \$684 million. As part of the final NOAA budget, Congress creates a new oceanic and atmospheric science scholarship program in honor of retiring Senator Ernest Hollings (D-SC). The bill envisions NOAA awarding undergraduate scholarships in oceanic and atmospheric science to U.S. citizens through a competitive process, in the hopes of increasing undergraduate interest in these fields and in oceanic and atmospheric science careers. The new program could total \$4 million in 2005.

Other Agencies

The **U.S. Geological Survey (USGS)** receives \$935 million for its total budget in FY 2005, a 0.3 percent cut. Its R&D funding declines 0.2 percent to \$545 million. Congress reversed many of the Bush Administration's proposed cuts to geology and water research programs, but could not bring funding above the FY 2004 level. Total Interior R&D declines 0.5 percent to \$672 million (see Table 14).

The **Environmental Protection Agency (EPA)** budget for FY 2005 was caught in the difficult VA-HUD spending bill; increases for veterans, housing and space programs squeezed out EPA funding. EPA's R&D declines 2.8 percent to \$598 million; most R&D programs remain at or slightly below FY 2004 levels (see Table 15).

Department of Transportation (DOT) R&D inches up 1.5 percent to \$718 million in FY 2005 (see Table 13). Congress rejected a large increase in highway R&D proposed by the Bush Administration, but boosted funding for aviation R&D.

R&D in the **Department of Veterans Affairs (VA)** declines 0.8 percent to \$813 million in FY 2005 (see Table 1). All VA R&D is performed in-house in the VA network of labs and hospitals and is focused on biomedical research with relevance to the veterans' medical needs.