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Key Players and the Nature of Their Interactions in U.S. STI Policy: Resource and Budgetary Allocations by the White House and Congress

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The Budget of the United States Government is the president's annual statement of overall federal fiscal policy: how much money the federal government should spend on public purposes ($3.6 trillion in FY 2014); how much it should take in as tax revenues ($3.0 trillion); and how much of a deficit ($627 billion) the federal government should run. Congress, acting through its budget and appropriations committees, must then enact twelve appropriations bills each year to fund the one-third of total federal outlays that are discretionary—otherwise those funds cannot legally be spent. Changes to mandatory programs, such as Social Security, Medicare, Medicaid, food stamps, civil service and military retirement benefits, veterans' disability benefits, and unemployment insurance, among other things, are controlled by the relevant authorizing committees and spending happens regardless of annual Congressional action. Of the $142.8 billion proposed for federal research and development (R&D) programs in FY 2014, virtually all is discretionary spending.

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This research brief focuses on how Executive Branch budget formulation and Congressional appropriation processes shape federal programs that fund R&D. Detailed descriptions of the formalities of each process can be found elsewhere.[1] A baseline observation is that the budgetary process in the U.S. federal government is different from that of almost any other national government. This is a consequence of the separation of powers that characterizes the U.S. constitutional system and of a long historical development in which new layers of institutional innovation have been successively added to—rather than replacing—existing ones.[2]

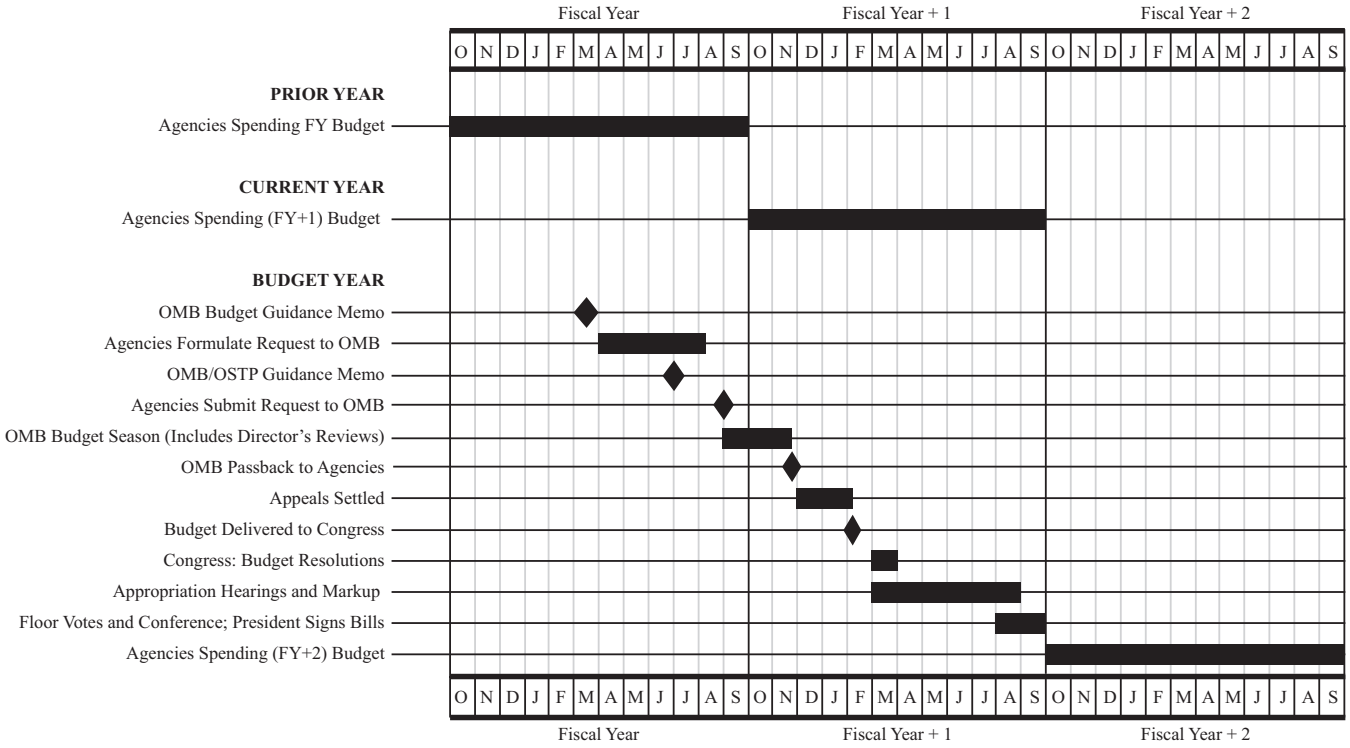
EXECUTIVE BRANCH BUDGET FORMULATION

The budget process begins approximately 10 months before the president submits his proposal to Congress and 20 months prior to the October 1 start of the fiscal year that the budget will cover. Agencies begin formulating their requests to the White House in earnest once the director of the Office of Management and Budget (OMB) issues the budget guidance memo in late spring. Concurrent with budget formulation by each of the agencies, the director of Office of Science and Technology Policy (OSTP) is facilitating conversations among the political appointees in the White House and those who lead research agencies to translate the broad priorities of the administration into more specific statements of priorities for the science and technology (S&T) budget now under development. Usually issued mid-summer, the S&T Priorities Memo is signed by the directors of OMB and OSTP.[3] The main value of the memo is the process of its development rather than the details of its language, although the memo is the vehicle OSTP and OMB use to signal which of the administration's research strategy documents, such the National Strategic Plan for Advanced Manufacturing in the case of the FY 2014 priorities memo, have reached a level of maturity that they can be used for interagency budgeting purposes, and which themes are to be emphasized in preparing future budget documents.

More importantly, OMB's spring guidance memo modifies any discretionary spending targets for the fiscal year under development that had been provided in the previous budget release. For example, the FY 2014 budget guidance memo says that agency topline for 2014 should be 5 percent below the net discretionary target provided for 2014 in the 2013 budget.[4] Each year the president decides his tolerance for future deficit spending in light of predicted mandatory spending, the impact that updates to the economic outlook have on revenue projections, and the evolving politics of the federal deficit. This is a decision taken with advice from the vice president, treasury secretary, chair of the Council of Economic Advisors, and the OMB director. The president's decision drives OMB's guidance calculation.

OMB targets are widely misunderstood by the political appointees in the agencies. OMB sees the adher-

Figure 1. Simplified timetable of the budget process



ence to guidance as compliance with a presidential decision; agency leadership perceives guidance as OMB usurping the authority vested in them as Senate-confirmed presidential appointees. A common mistake appointees in the agencies make is assuming that the budget formulation process is the venue to litigate exceptions to restrictive guidance levels. For example, multiple under secretaries with responsibility for the four energy technology programs in the Department of Energy (DoE) objected that their programs were being forced to absorb cuts imposed by lowering department-wide guidance levels while the weapons, environmental management, and science portfolios were not touched, even as the administration was touting the necessity of transforming the energy sector in response to the threat of climate change (for Democrats) or energy independence (in the case of Republicans). But the budget process within the executive branch is not the mechanism for creating exceptions; it is the tool for enforcing decisions made through other policy processes. That the under secretaries have been unable or unwilling to build broad coalitions to support the energy technology programs in their portfolio means it is likely that these programs will continue to absorb topline cuts.

OMB Budget Review

The next step in the process of formulating the president's budget request comes in September when agencies submit their requests to OMB. During the fall budget season, career OMB examiners evaluate the detailed agency requests for adherence to administration priorities, for the efficiency and effectiveness of program execution, and for any potential political conflicts lurking in the funding allocations proposed by the agencies. OMB examiners with responsibility for R&D accounts often invite the relevant OSTP policy analysts, who are nearly always professional staff on detail to the White House from the science agencies, to their budget hearings with the programs they oversee. The arrangement is mutually advantageous. Examiners get independent technical input from the PhD-level OSTP staff, and OSTP, with few formal powers and in a relatively weak position politically compared to other White House policy councils, gets an early route of access into R&D budget formulation. Needless to say, the budget is the most significant tool available in formulating policy for science.

Examining practice varies by account and by examiner, but the following R&D investment criteria for basic research programs developed in 2001 for the President's Management Agenda describe the contours of good examining practice for research programs.[5] The criteria were ultimately swept into the Program Assessment Rating Tool (PART).[6] Additional criteria for applied technology development, not discussed here, were developed with a strong ideological lens.

Traditional examining practice is based on a balanced approach where the quality and relevance of R&D programs are assessed prospectively and retrospectively in concert with judicious use of conventional performance metrics. Prospective evaluation of relevance includes evaluation of the clarity of the program's research strategy and ability to set clear, defensible, and achievable priorities. Since all research strategy documents are not of equal rigor, OMB held out the joint DoE–NSF Nuclear Sciences Advisory Committee's Long Range Plan and the National Academies' Astronomy and Astrophysics Decadal Survey, which covers National Science Foundation (NSF), NASA, and DoE programs, as examples of good multiagency planning processes.[7]

Prospective quality assessment focuses on the methods programs use for awarding funds and a justification for the program's funding distribution among classes of performers, for example, national labs, universities, or industrial research labs. The presumed gold standard for promoting R&D quality is NSF's competitive, peer-reviewed grants process. OMB has noted that award processes other than competitive merit review are justified by a need for timeliness (for example, R&D grants for rapid epidemiological studies), operation of unique facilities, or performance-based renewals in limited cases.[8]

Retrospective review of quality and relevance includes evaluation of whether a program's past investments were well targeted to significant issues, efficient, and productive. External advisory committees are used to evaluate relevance to national priorities, agency missions, and the utility of R&D results to both the field itself and to "users," broadly defined. Examiners look for excessive risk aversion, since good research management includes taking risks and working toward difficult-to-attain goals. NSF's Committee of Visitors mechanism was seen as a best-in-class tool for validating the quality of decision-making by program management.[9] Quantitative analysis of research portfolios such as bibliometrics, network analysis, and international benchmarking are generally underutilized in favor of expert opinion, which agencies have a stronger hand in crafting.[10] The "science of science policy" effort begun under the auspices of OSTP is trying to develop more analytical approaches for use in research policy.[11]

Conventional output performance metrics can be difficult to formulate for research programs where the goals are innovation, human capital production, and the dissemination of knowledge, applications, and tools. Research facility operations and construction projects are two elements of research program budgets that are more easily benchmarked. Quantitative earned-value metrics for cost and schedule are standard practice for the construction of R&D facilities, as are formalized independent project management reviews of technical cost, scope, and schedule baselines.

Director's Review

OMB career staff working with their program associate director, a political appointee, mark up proposals showing how agency requests can fit within guidance levels. They then defend those markups before the OMB director, for only the director can authorize budget requests above guidance levels. An interesting aside is that directors frequently invite the president's science advisor to director's reviews, particularly to those where budgets of the research agencies are to be discussed. Science advisors earn greater deference from OMB directors in having their priorities reflected in research agency budgets when they are perceived as providing actionable advice on scientific questions in other policy realms. Science advisors seen as mere in-house advocates for more research spending overall have far less influence with OMB.

After adjusting for decisions made in director's review, staff prepares the "passback," which conveys OMB's funding recommendations to the agencies, usually the Monday after Thanksgiving. Passback is one of the most significant vehicles whereby OMB has the opportunity to give instructions to the agencies on the design of new initiatives, program execution, or management issues. Although the level of detail can be extensive, the passback is written in general terms for those programs in which OMB and the administration have confidence and are willing to delegate a greater degree of authority.

Appeals

Agencies are given 48 hours to appeal OMB's decisions: they can appeal numbers or "language," those detailed instructions in the passback. Up to this point, budget formulation has largely been dominated by interactions between OMB and the agencies. Once the appeals arrive, the rest of the White House political staff and policy councils engage. Aggrieved agency appointees are lobbying Executive Office staff to weigh in on their behalf. Policy councils are arguing for adjustments to OMB's numbers to reflect either their priorities or to correct what they see as potential political miscalculations by OMB or the agencies. The policy councils only have so many "chits" to use and they are frequently far more interested in the regulatory or operational bureaus within agencies under their purview than they are in the R&D programs, so there is no guarantee that any council other than OSTP will weigh in.

The program associate directors and the OMB director have held back modest pots of money to settle appeals, so most are resolved in 2–3 weeks. Issues that the director cannot resolve go to the Budget Review Board (the vice president, White House chief of staff, the OMB director, and possibly another senior White House advisor or the treasury secretary, depending upon the administration), with a very limited number of appeals escalating directly to the president.

It is important to note that formulation of the president's budget is confidential and, other than the guidance levels and the final request, none of the interim numbers or underlying materials are made public. Not surprisingly, agency officials periodically leak details of adverse passbacks to important constituents or Congressional supporters. December calls from powerful senators or senior members of the House are not unheard of. All appeals must be settled by the middle of January so that the budget can go to printers for delivery to Congress and release to the public the first Monday in February.

THE CONGRESSIONAL APPROPRIATION PROCESS

In making appropriations from the Treasury, Congress is exercising the power of the purse granted to it under Article I, Section 9 of the Constitution, a power Congress guards jealously. Once the president's budget request arrives on Capitol Hill, a set piece of political theater unfolds. In the now common situation of a divided government, whichever chamber is controlled by the opposite political party pronounces the president's submission dead on arrival while promising to unveil its own budget proposal that will put the country on the path of fiscal responsibility. Behind the scenes, the budget, authorization, and appropriations committees have begun the process established by the Congressional Budget and Impoundment Act of 1974.

Budget Resolutions

After reviewing the president's proposed budget numbers and the thousands of pages of detailed justifications submitted by agencies within each of their jurisdictions, authorization committees prepare Views and Estimates for submission to their chamber's budget committee. Authorizers highlight policy differences, praise or pan administration initiatives, call out adverse impacts to committee members' district interests (regardless of party), and comment upon topics of significant prior oversight interest.

With input from the authorizers in hand, the budget committees set about formulating the majority's statement of an overall federal fiscal policy and, just as the president was forced to do, express their tolerance for future deficit spending. Allocating federal spending among 20 broad functional categories (such as national defense, agriculture, and transportation), the budget resolutions are not sent to the president and do not become law. Resolutions do not appropriate funds from the Treasury nor do they raise or lower revenues; instead, they serve as a blueprint for the House and Senate as they consider appropriations bills and budget-related tax measures.

When both chambers are controlled by the same party, a joint budget resolution is reached in conference—offering a statement of support for a president of the same party or setting out a starkly different vi-

sion when in opposition. In divided government, the chamber controlled by the same party as the president gains no political advantage by passing a budget resolution, which would only serve as a vehicle for mischief by the minority. Not passing a resolution exposes the majority party to the criticism that the president's party is not passing a budget, a rather hollow criticism given that budget resolutions do not have the force of law.

Appropriations

Once adopted, budget resolutions set ceilings, known as 302(a) allocations, for the House and Senate Appropriations Committees. The appropriations chairs then divvy out 302(b) allocations to each of the subcommittees, thus setting limits on the mark up of individual bills. While there is some rationale to subcommittee jurisdictions—one or two of the fifteen cabinet departments and a related subset of the 140 or independent agencies, boards, and commissions—there is no uniformity in the budget authority of each jurisdiction. In FY 2014, for example, the defense appropriation subcommittee controls a budget 124 times that of the legislative branch subcommittee.

Appropriators call hearings with Administration witnesses who defend the request; bills are marked up by the subcommittees and reported out for subsequent approval by the full committee. Committee reports, which provide detailed instructions and limitations on programs in each bill, are issued after full committee approval. The level of detail in Congressional budget justifications is the same as that submitted to OMB at the start of the fall budget season. For example, approximately 400 individual activity levels are reported in the $5.152 billion FY 2014 request for DoE's Office of Science, some below the million-dollar level. Tables in the appropriation reports impose controls below the account and major program level in wildly divergent levels—from no additional subdivision to 10–20 control points for an average-sized account to the listing of hundreds of individual water, transportation, or infrastructure projects.

Appropriations bills then move to votes by the full House or Senate. In theory, all appropriations of discretionary funding must be authorized. Members may object on the House or Senate floor to funding new programs started without prior authorization or to those with expired authorizations; however, that rule is routinely waived by the Rules Committee. As a practical matter, unauthorized programs can continue to be funded for years, thus muting the influence of authorization committees in the process of discretionary spending. The final steps are for the House and Senate to reconcile each separately passed appropriation bill through a conference committee. Once the conference report is adopted, the final bill is sent to the White House to be signed into law or vetoed.

The power of an appropriations subcommittee chair is substantial but diminished in the wake of House Speaker Newt Gingrich's reforms of the 1990s. The chair's mark establishes baseline allocations for programs and subprograms from which other members must find the votes and offsets if they are to force changes. Chairs also control report language that gives detailed budget execution direction to the agencies. Report language does not convey the force of law and is effectively not amendable, but agencies disregard subcommittee direction at their peril. Republican Conference six-year term limits for committee and subcommittee chairmanships and the appointment of lower-seniority members has diminished the House Appropriations Committee's power, making it more responsive to the demands placed on it by leadership.[12]

On occasion, however, they are the initiators of significant R&D budget policy. Labor/HHS Subcommittee Chair John Porter began the doubling of the National Institutes of Health budget over the period FY1999–2003, which was endorsed by President Clinton, subsequently authorized by Congress, and then continued through to completion under President Bush. Representative Jamie Whitten used his chairmanship of the Agriculture Subcommittee from 1949–1994 to lard earmarks into report language. By the end of his tenure, only formula funds to land grant universities exceeded earmarks as a fraction of the agriculture research budget, with peer-reviewed grants pulling up the rear.

In the Senate, the power is even greater since appropriations subcommittee chairs can also serve on the relevant authorizing committees. Senator Pete Domenici earned the title of "Saint Pete" for his ability to control programs and deliver DoE funding to his home state of New Mexico through joint chairmanship of the Energy and Water Appropriations Subcommittee and the Energy and Natural Resources Authorization Committee.

During the period of Congressional action on the budget resolutions and the appropriations bills, OMB, the agencies, and lobbyists for a wide variety of constituencies have been carefully monitoring progress at each step. Cuts, unwanted increases, or "riders" limiting the president's authority to execute some other enacted statute are flagged. If serious enough, formal veto threats are issued from the White House in Statements of Administration Policy.

Once signed and enacted into law, OMB apportions the appropriated funds into the Treasury accounts, which the agencies can then spend. Apportionment, once a powerful tool for OMB, was severely limited by Congressional action after anger at President Nixon's aggressive approach to its use and now has few uses other than controlling which quarter funds are obligated within the fiscal year.

Impact of the Deficit on the Appropriations Process

Political tensions over the size of the federal deficit and deep divisions over the role and appropriate size of the federal government come to a head during the appropriations process. Failure to pass appropriations bills by the October 1 start of the federal fiscal year requires passage of stop-gap continuing resolutions (CRs) holding agencies to the prior year's funding levels. Even in times when deficit spending is of low political salience, the political horse trading necessary to get an appropriations bill to the floor takes effort. Some subcommittees, like Defense and Military Construction, used to have a track record of getting their bills passed on time. Others resorted to CRs, historically lasting a few weeks to a month.

Now that the federal deficit is a major point of political conflict not only between the major parties but within the Republican Party itself as moderate and mainstream conservatives face challenges on the right from Tea Party and Club for Growth activists, the appropriations process is all but broken. Leadership is forced to resort to deviations from normal order to get the government funded. Fatigue in the face of political polarization and partisan gridlock has led to more frequent use of omnibus appropriation bills where multiple bills get rolled into a single, must-pass vehicle. Brinkmanship over government shutdowns yields full-year continuing resolutions—the final flare of majority surrender—where major decisions on spending are delayed to the next session or to the next Congress. Of the 123 stand-alone appropriations bills Congress should have passed for the period FY2003–2013, only 33 were signed into law. The other 75 percent rolled into an omnibus, "minibus," consolidated bill, or CR.

AGENCY COMPETITION IN THE FEDERAL BUDGET PROCESS

Unlike countries with a single science ministry, U.S. federal research funding is dominated by five agencies. Defense accounts for 48 percent of the FY 2014 R&D request, NIH 22 percent, Energy 9 percent, NASA 8 percent, and NSF 5 percent, with an additional 22 agencies reporting the remaining 8 percent. Coordination of such a distributed R&D portfolio is a challenge for OMB and OSTP but is effectively impossible for Congressional appropriations and authorizing committees.

It is important to note that OMB and Appropriations not only have differing jurisdictions, they have differing staff capacities. OMB's jurisdiction is the full executive branch, with 250 of OMB's 500 staff sitting in five resource management offices (RMOs) overseeing both mandatory and discretionary spending proposals. Given that the president has responsibility for the full executive branch, coordination within OMB and with other parts of the Executive Office is the default assumption.

Congressional committees and subcommittees seek to maximize control over the programs in their jurisdictions, with intra-Congressional competition being more common than cooperation. Compared with OMB, the House Appropriations Committee has approximately 160 staff (not just the professional staff marking up budgets). Senate Appropriations has approximately 80. In each case the staff is split between the majority and minority.

Within OMB, one-half of the R&D portfolio sits in the National Security Programs RMO, one-quarter within Health Programs, and a quarter within the Natural Resources Programs RMO (see Table 1). At 8.5 percent, defense R&D is small on the overall scale of the defense, veterans affairs, state, and international affairs programs in the National Security RMO.

On the Congressional side, the federal R&D portfolio is concentrated in four appropriations subcommittees, as shown in Table 2. It is important to note that the competition changes moving from OMB to Congress. Within OMB, funds can move between RMOs either by agreement of the program associate directors or as instructed by the OMB director. By comparison, once the 302(b) allocations are set, moving funds between the subcommittees is practically impossible.

The DoE R&D programs that compete in OMB's Natural Resource Programs with NASA, the National Oceanic and Atmospheric Administration, the U.S. Department of Agriculture, the U.S. Geological Survey, and the Environmental Protection Agency are the only R&D programs under the Energy and Water Appropriations Subcommittee. DoD R&D programs face somewhat similar competitive environments at OMB's National Security Division and within Defense Appropriations, the major difference being that the Department of State and foreign operations agencies included in OMB's National Security Programs are split off into a separate appropriations bill. The major change for NIH is that it goes from looking like a small part of OMB's Health Programs RMO to being a significant fraction of the Labor/HHS portfolio, and so its political salience rises on the Hill.

RESEARCH AGENCY LEADERSHIP AND THE BUDGET PROCESS

In closing, I have a few observations about the political appointees who lead research agencies. In a study of appointee continuity during the presidential administrations of George H. W. Bush, Bill Clinton, and George W. Bush, Matthew Dull and Patrick Roberts found the median tenure of 2,278 presidentially appointed and Senate confirmed (PAS) appointees was 2.5 years, with one-quarter remaining in office only 1.5 years.[13] The two agencies in their study with the shortest tenures were DoE, the most research-intensive cabinet agency (45 percent of its FY 2014 request); and the Executive Office of the President (which includes OSTP's six

Table 1. OMB resource management offices and their R&D portfolios

OMB RMO	Major R&D programs	R&D Request (FY 2014 $B)	Discretionary Spending (FY 2014 $B)	Mandatory Spending (FY 2014 $B)	R&D Share of RMO Total
Natural Resource Programs	NASA; NSF; DoE: Science, fossil, nuclear, energy efficiency and renewable energy, electricity reliability; Smithsonian	37.60	82.20	29.53	33.7%
National Security Programs	DoD RDT&E, Navy RDT&E, Army RDT&E, Air Force RDT&E, DoE NNSA	75.85	741.58	149.59	8.5%
Health Programs	HHS R&D programs, including NIH	32.54	58.44	870.65	3.5%
General Government Programs	NOAA, NIST, DHS S&T	5.18	134.87	140.60	1.9%
Education, Income Maintenance, and Labor Programs	Department of Education	0.41	120.44	1,294.40	0.3%
	Totals	151.58	1,137.53	2,484.77	

Table 2. Appropriations committees that control the federal R&D portfolio

Subcommittee	Major R&D programs	R&D Request (FY 2014 $B)	Total Request (FY 2014 $B)	R&D Share of Total
Commerce, Justice, Science	NASA, NSF, NOAA, NIST	31.85	63.31	50%
Energy and Water	DoE: Science, fossil, nuclear, energy efficiency and renewable energy, electricity reliability, NNSA	9.89	30.43	33%
Labor, HHS, Education	HHS R&D programs, including NIH; Department of Education research	32.95	121.80	27%
Defense	DoD RDT&E, Navy RDT&E, Army RDT&E, Air Force RDT&E	67.52	512.52	13%
	Totals	142.21	728.06	

confirmed appointees), which had a median tenure of 1.9 years, with one-quarter remaining in office only 1.2 years. Further work needs to be done to look specifically at appointees in S&T positions, but whether appointees jump to another appointment or leave government altogether, at least half leave before a single budget cycle has been completed. This is not long enough to guide implementation of any policy initiative.

Coupled to short tenure is a low level of experience in government. As Susan Cozzens notes, a number of those engaged in S&T policy development achieves a measure of prominence in their research field prior to beginning a "committee career" of serving on advisory panels, committees of the National Academy of Science, and possibly the President's Council of Advisors on Science and Technology or the National Science Board.[14] PAS appointees in research agencies are most frequently drawn from this cohort, which Cozzens refers to as the "amateurs." For many research agency appointees, the Senate-confirmed position is their first in government. In the first-term Obama administration, only 5 of 13 PAS appointees with responsibility for the energy technology and science portfolios at DoE had any prior position in government. A notable counterpoint is the career path of Pat Gallagher from instrument scientist at the National Institute of Standards and Technology's Center for Neutron Research through a tour at OSTP as a policy analyst to his current position as Under Secretary of Commerce for Standards and Technology.

One consequence of this combina-

tion of short tenure and general inexperience within government is the trouble appointees have influencing the complicated and frequently bewildering process of budget formulation. The source of this is structural; everything the agencies do is a delegated authority flowing from powers vested in either the president or Congress. The sole enumerated Constitutional duty of cabinet secretaries is producing reports.[15]

Unlike the formally linear chains of authority in corporate or academic settings, the federal departments and agencies sit between co-equal executive and legislative branches, accountable to and controlled by both. Federal research programs are generally quite stable, and their appropriations are governed more by distributional politics than ideology. But where there is partisan conflict over the appropriate role of the research program or a concern that additional scientific research will drive additional regulation, appointees in the S&T agencies do not have a good track record of navigating those conflicts successfully. The net result is that programs can get whipsawed by politics. In a study of the year-to-year variation in funding for fossil energy, energy efficiency, and renewable energy at the DoE for the period 1978–2008, Harvard's Energy Technology Innovation Policy research group found that there was a one in three chance that these programs would receive a funding change (increase or decrease) greater than 27 percent.[16]

OSTP could address some of these issues with respect to the level of prior government experience among S&T appointees. The time between nomination and confirmation is growing, and OSTP could require attendance at a "government boot camp" during the waiting period. The week-long program the American Association for the Advancement of Science puts its incoming Science and Engineering Fellows through prior to placement in Congressional offices or executive branch agencies could serve as a model.

Endnotes

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