

TECHNOLOGY AND PUBLIC PURPOSE PROJECT

# Building a 21<sup>st</sup> Century Congress:

## Improving Congress's Science and Technology Expertise

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FACULTY DIRECTOR

Ash Carter



HARVARD Kennedy School

**BELFER CENTER**

for Science and International Affairs

PAPER

SEPTEMBER 2019

## **Technology and Public Purpose Project**

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# Acknowledgments

Technological change has brought immeasurable benefits to billions through improved health, productivity, and convenience. Yet as recent events have shown, unless we actively manage their risks to society, new technologies may also bring unforeseen destructive consequences. Making technological change positive for all is the critical challenge of our time.

To this end, Harvard Kennedy School's Belfer Center for Science & International Affairs launched the Technology and Public Purpose (TAPP) Project. Led by Belfer Center Director, MIT Innovation Fellow, and former Secretary of Defense Ash Carter, the TAPP Project works to ensure that emerging technologies are developed and managed in ways that serve the overall public good.

The United States Congress has a vital role to play in ensuring that emerging technologies are developed and managed in ways that serve the overall public good. It is important, then, to understand how Congress learns about, and acts on, emerging technologies—the focus of this report.

This report would not have been possible without the assistance of over 140 individuals—members of Congress, current and former congressional staffers, academics, nonprofit leaders, and more—who took the time to speak with us about how Congress works and what it needs to be more effective. We are grateful for their time and perspectives.

Thank you to the National Academy of Public Administration for reviewing our interview plan and offering helpful feedback during multiple stages of this report. Additionally, we are grateful to Emily Chi for conducting research and to Allison Lazarus for helping to conduct many of the interviews for this report.

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# Glossary

**CBO:** Congressional Budget Office

**CRS:** Congressional Research Service

**GAO:** Government Accountability Office

**GAO's STAA:** Science, Technology Assessment, and Analytics Team

**OTA:** Office of Technology Assessment

**S&T:** For the purposes of this report, science and technology (S&T) are defined as:

**Science:** “the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment.”

**Technology:** “the application of scientific knowledge for practical purposes.”

**S&T Resources:** For the purposes of this report, S&T Resources are defined as:

“Any information channel that provides technical or scientific expertise or knowledge to U.S. government policymakers. This includes, but is not limited to, written products of varying lengths and formats; seminars, workshops, and trainings; expert testimony and briefings; and fellowships to place staff with S&T backgrounds within government offices.”





# 1. Executive Summary

The Constitution of the United States of America gives Congress the power to draft legislation for the nation and to conduct oversight of the executive and judicial branches.

As the world has become more complex, so too have Congress's responsibilities. When paradigm-shifting technologies like artificial intelligence and quantum computers are created, Congress's role is to pass legislation that protects the public while encouraging innovation, and to conduct oversight on how the executive branch uses the technologies.

**Congress is one of the most advised bodies in the world.** Members of Congress can connect with the world's experts in groundbreaking fields by holding information-gathering hearings in their committees; they can task support agencies like the Congressional Research Service (CRS) and the Government Accountability Office (GAO) with providing in-depth information on a topic; they can ask august bodies like the National Academies to conduct far-reaching research. Members are also inundated with unsolicited information from a variety of external sources.

And yet, when it comes to many emerging technologies, Congress has not shown that it has the necessary capacity and expertise to fully exercise its constitutional duties. While members of Congress in both chambers often produce thoughtful legislation on established science and technology (S&T) issues, **in legislation and high-profile hearings, Congress has appeared unprepared to reckon with emerging technologies and their effects on society.** In recent years, Congress has failed to produce substantive legislation on emerging S&T issues of national import, like personal data privacy and protections.

What explains how Congress can simultaneously be one of the world's most advised bodies while lacking the capacity to reckon with emerging S&T issues? Some, after watching congressional hearings featuring social media executives, pin the blame on members of Congress not being subject matter experts. Others blame tech executives, saying that they skirt any real responsibility by playing into Congress's limited knowledge of tech. And some simply believe that inaction is a function of political gridlock—that Congress *could* act but chooses not to do so for political purposes.

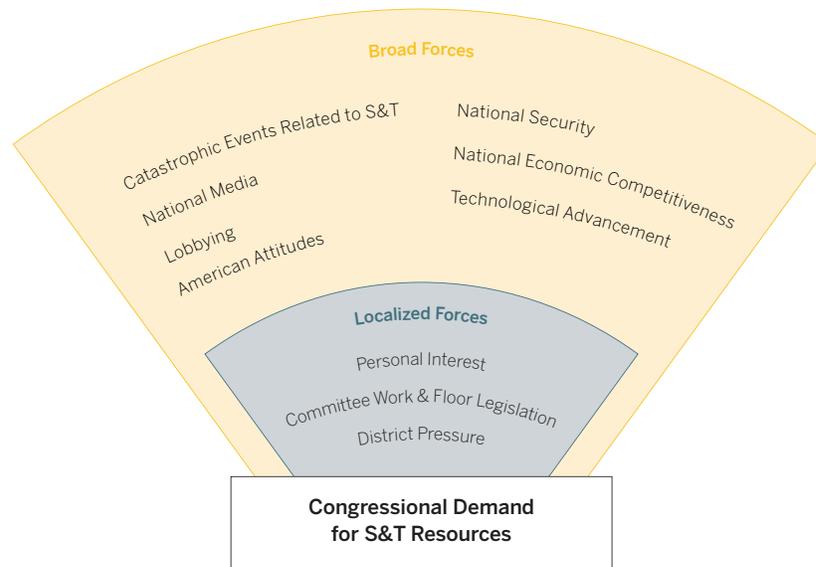
**These explanations ring a bit hollow: they hint at shallow symptoms but seem to miss the root causes of the problem.**

Recognizing the importance of having a well-resourced Congress that can tackle complex S&T topics, this report seeks to go deeper. Through extensive interviews, surveys, and focus groups, we gathered input from over 140 stakeholders—former members of Congress, current and former congressional staff members, scientists, lobbyists, activists, researchers, and policy experts at think tanks and in academia—to identify and analyze how Congress receives and uses the S&T information it needs to legislate and conduct oversight. We show that many forces are increasingly driving members of Congress to seek out additional S&T resources. We then highlight the divide between what Congress needs and what it has available to it, before offering several actions that we believe would help Congress more effectively serve the public good.

This report is not an exhaustive study of all congressional demands for S&T information, nor does it attempt to comprehensively list all S&T expertise channels available to Congress. Instead, it is meant to provide an overview of the Congress's current S&T-relevant needs and resources to stimulate discussion on the topic and suggest potential actions to address existing gaps.

## **What Drives Members of Congress to Seek Out S&T Information?**

Many forces compel congressional action on S&T topics, which in turn drives members of Congress to seek out S&T information to aid in their decision-making processes.



As a body, **Congress is driven to address S&T issues by several broad forces**, including the pace of technological advancement, which creates new opportunities and concerns; catastrophic events, which cause Congress to react; national security, which drives demand for S&T research and development; and national economic competition, which, among other things, compels Congress to allocate funding to federal research and development. Other broad forces include pressure from the news media, lobbyists, and advocacy organizations, and American attitudes towards technology.

Additionally, **there are several localized forces that act on individual members of Congress**. Members seek S&T information when constituents pressure them for information or to recommend they act on an issue, when committee work or floor legislation centers on an S&T topic, or when they are simply personally interested in an S&T topic.

**These forces are interconnected and reinforcing.** For example, a catastrophic event, like Hurricane Katrina and its aftermath, spurs national and district pressure and drives committee work, all of which compels members of Congress to seek out S&T information to make decisions.

### ***What S&T Information Is Available and How It's Used?***

When members of Congress and their staff seek S&T information to aid in their decision-making processes, they have several resources available to them.

Internally, **members can draw on the knowledge of personal staff, committee staff, and support agencies like the CRS and GAO.** Externally, Congress is advised by a diverse set of bodies and actors, including the executive branch, think tanks and universities, civil society and non-profits, lobbyists and industry associations, and the National Academies. Personal offices and committees also use hybrid resources like non-permanent fellows and detailees, who often have specific technical or operational expertise.

In interviews and a survey conducted for this report, current and former congressional staffers, scientists, technologists, policy experts, activists, and lobbyists discussed how S&T resources are used by congressional personal offices and committees. Several patterns emerged; among them:

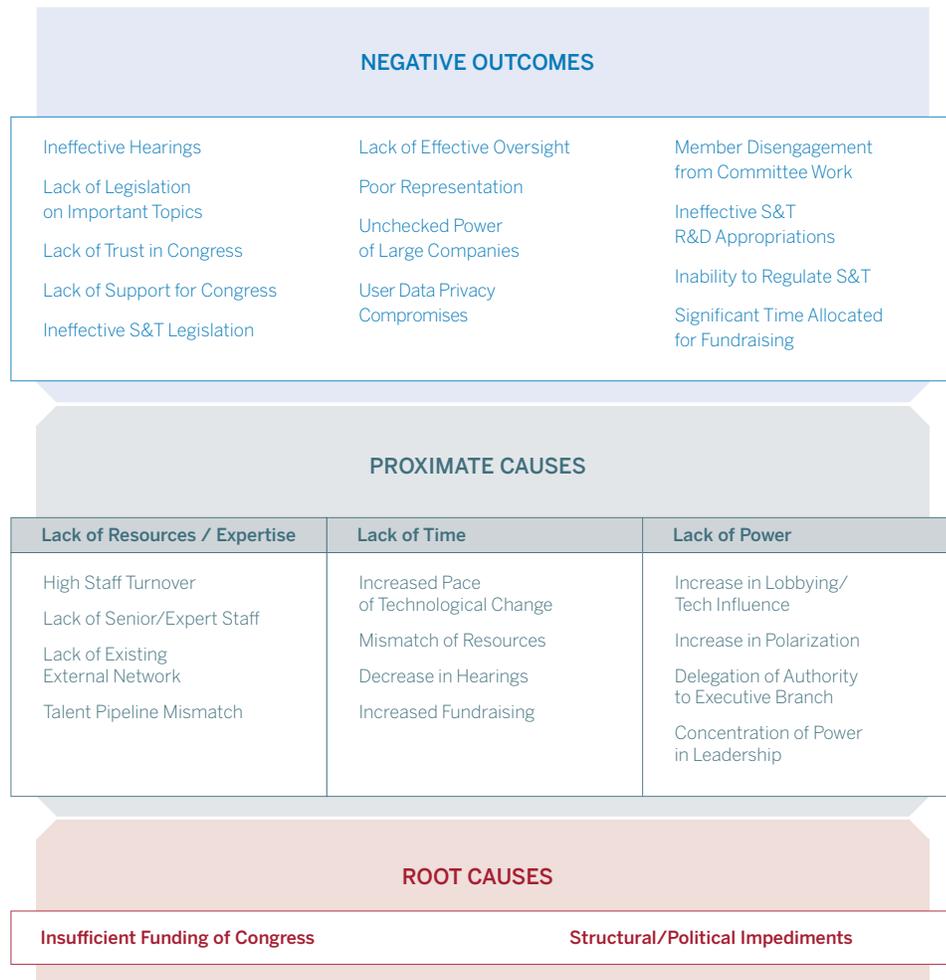
- **Committee staff members** are often used as **evaluators** of technical information, **connectors** to a wider network of experts from academia and the private sector, and **decision-makers** on legislation;
- **CRS** staff are known to be quick, effective **compilers** of research into a given topic and historians of previous legislative efforts;
- **Executive branch staff** are regarded as **subject matter experts** with deep technical expertise who are often consulted with prior to drafting legislation;
- **Academic, think tank, and non-profit staff** are thought of as **educators, trainers, and influencers**, both on specific S&T policy topics and on their applications to the day-to-day work of Congress;
- **Lobbyists and industry associations** are known as **advocates** for industry or company viewpoints, **trainers** on S&T topics, and **influencers** of legislation; and
- **Fellows and executive branch detailees** are lauded for their ability to serve as effective **translators, reality checkers, and educators** in personal offices and committees.

	TYPE OF RESOURCE	VALUE-ADD TO CONGRESSIONAL STAFF
 INTERNAL RESOURCES	<b>Committee Staff</b>	<b>Evaluators</b> of technical information <b>Connectors</b> of expert networks <b>Decision-Makers</b> on legislation
	<b>Congressional Research Service</b>	<b>Compilers</b> of in-depth literature reviews <b>Historians</b> of past legislative efforts
	<b>Government Accountability Office</b>	<b>Collaborators</b> on research and audits
	<b>Congressional Budget Office</b>	<b>Estimators</b> of policy's budgetary effects
 EXTERNAL RESOURCES	<b>Executive Branch Agencies</b>	<b>Experts</b> on S&T topics and government implementation efforts
	<b>Think Tanks, Academia, and Non-Profit Organization</b>	<b>Educators</b> of research on related S&T topics <b>Trainers</b> on S&T topics and policymaking process <b>Influencers</b> of legislation
	<b>Industry Associations and Lobbyists</b>	<b>Advocates</b> for industry or company viewpoints <b>Trainers</b> on S&T topics <b>Influencers</b> of legislation
	<b>National Academies</b>	<b>Authorities</b> on S&T topics
	<b>National Laboratories</b>	<b>Authorities</b> on S&T topics
 HYBRID RESOURCES	<b>Fellowships and Detailees</b>	<b>Translators</b> of technical information <b>Reality Checkers</b> on received information <b>Educators</b> on S&T issues for internal staff
	<b>Media/Internet Research</b>	<b>Aggregators</b> of timely S&T news

## How to Bridge the Divide?

Despite the quantity of advice offered to personal offices and committees, significant gaps remain that hinder Congress’s ability to produce timely, thoughtful, and comprehensive legislation on S&T issues. This results in a multitude of negative and many times public outcomes, such as ineffective or absent S&T legislation.<sup>1</sup>

### Understanding the root causes of a lack of congressional S&T capacity



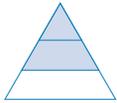
<sup>1</sup> For more on the root causes of congressional dysfunction, see the Appendix.

**At the core of the problem is a divide between what Congress can absorb and what information it receives.**

**Bridging the Divide: Actions to Increase Congress's S&T Capacity**

**GAPS**

**ACTIONS**



**INSTITUTIONAL SUPPORT GAP**

Congress does not have a support body exclusively focused on S&T issues to provide objective, in-house consultation.

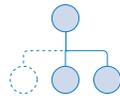
**CREATE A CONGRESSIONAL SUPPORT AGENCY THAT IS**

**Embedded** within Congress to ensure 'shared staff' approach

**Able to incorporate** all external perspectives

**Structured** to be adaptable to the changing needs of Congress

**Options-oriented** to give Congress multiple policy options



**S&T TALENT GAP**

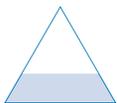
Congress lacks robust recruiting pathway for diverse S&T talent.

**REEVALUATE PROCESS FOR FINDING S&T TALENT BY**

**Creating Paths for Undergraduates Pursuing S&T Majors to Come to Capitol Hill.** Congress, universities, and foundations should work together to encourage S&T students to work on Capitol Hill.

**Reimagining Talent Pathway to Encourage S&T Hires.** Create a mid-career pathway to enable S&T experts to work for Congress at level commensurate with their experience.

**Expanding Policy Training.** Ensure that S&T experts can be effective congressional staff members



**INTERNAL RESOURCING GAP**

Congress does not give itself the resources to hire enough people with the right skillsets.

**ADDRESS STRUCTURAL GAPS BY**

**Investing in Itself.** Increase the resources available to personal offices, committees, and support agencies.



**EXTERNAL RESOURCES GAP**

While many consider Congress the "most advised body in the world," many of the resources available are less useful than they could be.

**EXTERNAL RESOURCE PROVIDERS SHOULD**

**Offer Customized, Concise, and Timely S&T Information.** Congressional staffers highlight these attributes as particularly important.

**Build Relationships with Offices Over Time.** A consistent relationship will help ensure that a message is heard by the office.

On the internal side of the divide, **Congress has simply not given itself the resources needed to efficiently and effectively absorb new information**—particularly on complex S&T topics. Legislative support agencies and committees have been allowed to atrophy, reducing policy expertise on S&T issues and institutional knowledge about policymaking and how to be effective in Congress. Congressional offices are not given the resources necessary to recruit and retain the number of experienced staff needed.

On the external side of the divide, **while Congress is inundated with resources, it often does not have information that fits its specific S&T needs**. Sometimes, the messenger is biased; other times, the policy implications are not clear, or the resource is too dense to quickly glean useful insights from it.

While existing initiatives are likely to help bridge the divide between what Congress can absorb and what S&T information it has available to it, we note four actions that would improve Congress's ability to incorporate S&T knowledge into its decision-making processes:

- 1. Congress Should Address Its Institutional Gap by Creating a Legislative Support Body Focused on S&T Issues.**

Congress lacks a support agency focused on S&T issues. Because of the value of having independent, expert S&T staff on site is well known, it should create one. Such a support agency would be:

- **Embedded in Congress.** Congress would benefit from a support agency that offers a 'shared staff' model for S&T issues. This body should be led by a bipartisan and bicameral team capable of steering it through controversial topics and shielding it from excessive partisan criticism.
- **Empowered to incorporate external perspectives.** This new body should be empowered to consult with outside experts, both during deliverable production and review. All stakeholders should be engaged and consulted, and all options—including creative, non-traditional ones—should be considered as part of the process. Incorporating external

perspectives would both increase the body's knowledge base and create a network of valued experts to draw on for current and future staff members.

- **Structured to be adaptable to the changing needs of Congress.** The body should be nimble enough to adapt to changing congressional demands, and capable of producing specific deliverables that satisfy various needs.
- **Options-oriented.** Rather than give a specific policy answer, or elide options altogether, this body should give data-driven policy options.

## 2. **Congress Should Hire Additional S&T Talent in Personal Offices and Committees.**

Fellowship organizations like TechCongress have shown the value of having additional experienced scientists and technologists on committees and in personal offices. Congress should actively solicit S&T fellows and increase the number it uses.

Additionally, Congress should also adopt a modernized staffing model that brings technical talent into personal offices and committees on a permanent basis. This would allow Congress to capture the technical expertise of the individuals and the policymaking skills gained through time working on Capitol Hill.

To do so, Congress should:

### a. **Build pathways for S&T undergraduates to learn about opportunities on Capitol Hill.**

Congressional hiring pathways often begin at the undergraduate internship level; as one current staffer noted, strong unpaid interns become full-time entry-level employees, who then are promoted from within to more senior positions.

Recognizing this, Congress and universities should work together to ensure that computer science and engineering students know that pursuing policy work is a path that they can take. Congress should seek out undergraduates

pursuing S&T majors and get them working on Capitol Hill through internships and fellowships. This will require congressional offices to broaden their networks to ensure that they have access to this group of traditionally non-traditional hires. Leaders of science and engineering schools should highlight opportunities in Congress to their students, many of which are likely unaware of opportunities on Capitol Hill. They should be creative about offering credit for “semesters abroad” in Washington, D.C., too, so students feel they can take advantage of the opportunity without sacrificing their education.

Congress, universities, and foundations should work together to ensure that Capitol Hill opportunities are paid, because they will be competing with the private sector to recruit S&T students.

**b. Better promote congressional career opportunities within experienced technical communities.**

Congress should also **reevaluate its pathway for experienced hires**. This will require breaking from traditional hiring practices; individuals with PhDs do not want to start as unpaid interns. Fellowships are one path to hiring experienced technical talent into permanent staff positions; Congress should look at others, as well.

Several groups can play a role in educating mid-career S&T experts on opportunities to work on Capitol Hill, including universities, national laboratories, think tanks, and foundations.

**Congress should take steps to better prepare mid-career hires with S&T backgrounds for success in policymaking roles through training and mentorship opportunities.**

Internally, Congress can rely on the CRS to provide a tailored institutional curriculum to newly-hired scientists and technologists on staff. Externally, Congress can look to academia, think tanks, and foundations to offer additional training resources.

### 3. **Congress Should Address Broad Structural Gaps by Increasing Its Funding.**

**Congress should invest in itself.** It should increase committee and support agency budgets to allow them to hire additional staff members and pay a more competitive salary, which will help them retain the staff they already have. Specific to the House of Representatives, Congress should raise members' personal office budgets, remove the cap on office personnel, and increase the staff pay ceiling.

This recommendation is politically challenging, both within and outside of Congress. Within Congress, party leadership may be wary of increasing committee size and stature, which it may see as reducing its own authority. Outside of Congress, it may be challenging for members to vote to increase their body's own funding.

### 4. **External Resource Providers Should Seek to Produce Information in Formats that Congress Values**

Multiple current and former staffers argued that the best external information they received was often **short and concise, customized for the audience, consistently offered, and timely**. Some resource providers do this already; others do not.

Of course, S&T information should not always be provided with exactly these characteristics; they apply principally to shorter policy briefs on S&T topics. Sometimes, long and dense reports are necessary to explain a topic; other times, trainings and roundtables are the proper format for policy briefings.

To help S&T experts learn how to write effective policy resources, universities and think tanks should help train S&T resource providers to tailor their messages to Congress.

\* \* \*

The United States of America has changed drastically since its founding, and Congress has changed with it.

In the first half of the 20<sup>th</sup> century, congressional leaders added staff and nonpartisan expertise in a recognition that the pace of change was outstripping their ability to reckon with it. In the second half of the 20<sup>th</sup> century, a new generation of congressional leaders created nonpartisan centers of fact and analysis to, in part, serve as a bulwark against the increasing power of the executive branch.

Today, congressional leaders should once again take stock of Congress's capacity.

They should recognize that Congress is falling behind—that it is less capable of responding to scientific advancements and technological innovations than it should be. In the years ahead, Congress will need to confront issues like climate change, artificial intelligence, and synthetic biology—to say nothing of the technologies yet to be invented or the scientific advancements yet to be discovered.

They should understand that Congress's falling behind is, partly, their fault—the clear and unsurprising consequence of hollowing out committee and support agency staff while not giving members the resources they need to do their jobs. As a result, they have knowingly given away the power granted to them by the U.S. Constitution to the executive branch.

And they should remember that they have the power to do something about it. Reinvesting in congressional personal offices, committees, and support agencies would give Congress the space to be more proactive about S&T issues. Hiring a greater proportion of staffers with technical talent and creating a new S&T-focused support agency would give Congress the in-house expertise to craft quality legislation and conduct meaningful oversight.

It is not only Congress's responsibility to improve its S&T capacity; universities, think tanks, foundations, and S&T experts have important roles to play, too. Universities and foundations need to help Congress update its hiring pathways by encouraging undergraduates pursuing S&T degrees to apply their knowledge to the policymaking process, and by actively

working with Congress to ensure that students have a positive experience. Separately, think tanks need to help prepare mid-career S&T experts interested in working on Capitol Hill by training them on how Congress works and how they can be effective policymakers on Capitol Hill—a very different working environment than a research laboratory or a private company.

Shoring up Congress's internal capabilities will go a long way towards improving its S&T capacity, but providers of S&T expertise must also do the work of learning how to take their research and expertise and distill it into something that Congress can efficiently use. Universities and foundations need to also invest in trainings and programs designed to teach experts how to inform, and work with, Congress.

Detractors will argue that spending more on Congress is a waste of taxpayer funding—that existing internal and external resources are enough for Congress to do its job. They will argue that Congress is a body built for generalists to work in, not for those with specific technical expertise. They will argue that existing bodies can and are doing the type of long-term thinking on scientific advancements and technological innovations, and therefore nothing new is needed. They will argue that there are plenty of outside experts capable of informing Congress.

And yet: few argue that Congress is doing a good job on S&T issues. What exists now is not working; something new is needed.

Updating Congress for the 21<sup>st</sup> century will not be easy. It will require members to take unpopular votes on increasing Congress's funding, and to make the case to their constituents that the least popular and least trusted branch of government should be stronger. It will require members and their staff to build new pathways into the organization, to bring in talent that was previously excluded from consideration. It will demand bipartisan cooperation in an age of polarization, to give a new support agency the space it needs to honestly reckon with S&T issues—even, and especially, when the answers it provides are not politically convenient.

But forming a more perfect union has never been easy. It has always demanded courage and conviction, passion and perseverance. It has always

taken effort to build something new, updating old bodies for new circumstances. As the branch of the federal government closest to the people, it is up to Congress to do the work of establishing a more perfect union. It is time to get to work.



## 2. S&T Demand: What Drives Members of Congress to Seek Out S&T Information?

*“Today, science and engineering research and innovations are intricately linked to societal needs and the nation’s economy in areas such as energy, transportation, communication, agriculture, education, environment, health, defense, and jobs. As a result, policymakers are interested in almost every aspect of science and technology policy.”<sup>2</sup>*

—Congressional Research Service

Many forces compel congressional action on S&T topics, which in turn drives members of Congress to seek out S&T information to aid in their decision-making processes. As the CRS notes, Congress has an important role to play in the S&T space:

“Several issues of potential congressional interest apply to federal science and technology policy in general...In addition to appropriating funding for S&T programs, Congress enacts laws to establish, refine, and eliminate programs, policies, regulations, regulatory agencies, and regulatory processes that rely on S&T data and analysis.”<sup>3</sup>

2 Stine, “Science and Technology Policymaking: A Primer,” 5.

3 Gottron, “Science and Technology Issues in the 116th Congress,” 1–2.

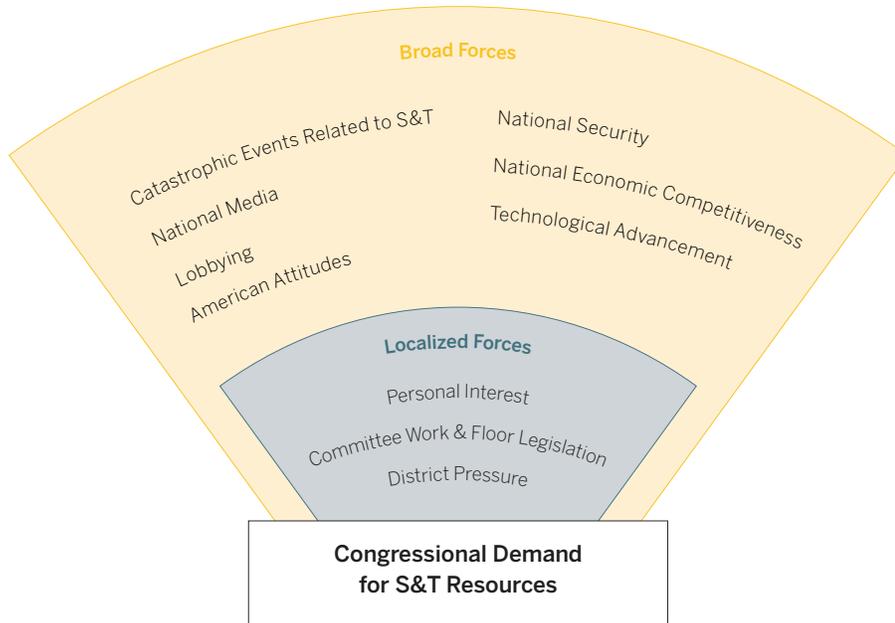


Figure 1. Congressional Demand for Science & Technology Resources  
 Source: Interviews, Author Analysis

More broadly, though, S&T issues are inherent in nearly everything Congress does. Whether considering a piece of legislation on agriculture or health care, jobs or geopolitics, S&T resources are needed to develop an understanding of a problem, reckon with potential policy options, and decide on an appropriate path forward. Some forces act on Congress as a whole; in other words, they affect the entire country. Other forces are more localized to individual members of Congress; they are primarily state and district concerns. Many of the broad and localized forces act on and reinforce one another. Drawing clear lines between these forces is simply a stylized way to describe them, as they are all interconnected and reinforcing.

# Broad Forces

Our analysis indicates that there are seven broad forces that act to drive congressional demand for S&T information:

## 1. Technological Advancement

Scientific advancements and technological innovations bring with them new opportunities and new challenges. Congress acts to accelerate opportunities and ameliorate challenges with emerging technologies.

For example, synthetic biology is a young field that combines biology with engineering principles to turn living cells into living “factories”—like adding a gene to *e. coli* to cause it to produce valuable antimalarial drug.<sup>4</sup> One of the enabling technologies for synthetic biology is DNA synthesis—‘printing’ DNA and whole genes from chemical precursors. This technology can be used to create a gene that produces an antimalarial drug or, potentially, a bioweapon like smallpox; it is a ‘dual-use’ technology that can be used in positive or negative ways.

Dual-use technologies like DNA synthesis pose important policy questions to Congress. To address those questions, Congress must have some understanding of the benefits and risks of action or inaction. Too much regulation, and a powerful technology may limit the benefits for society; too little regulation, and the technology pose catastrophic risks to global security.

The pace of S&T advancement, then, innately drives Congress to demand information that could help it understand new technologies and their societal implications. Correspondingly, S&T issues have recently taken greater prominence in CRS reports. In 2017, “Science and Technology” became one of the “main issues” in the CRS Annual Report; in 2018, the CRS produced 90 products in the S&T category—more than the average number of products for a legislative category.<sup>5,6</sup>

4 Dette and Miesen, “To Print a Pathogen, Click Here,” 14.

5 Library of Congress, “Congressional Research Service Annual Report, Fiscal Year 2017.”

6 “Congressional Research Service Annual Report, Fiscal Year 2018.”

## 2. Catastrophic Events Related to Science & Technology

Members of Congress react to catastrophic events that affect their constituents by passing new legislation and conducting oversight of the federal agency responding to the event. Often, catastrophic events and their responses touch on S&T issues, requiring members of Congress to demand S&T information to fulfill their responsibilities.

Natural disasters often lead to congressional review and action. In 2005, for example, Hurricane Katrina's devastation of the Gulf Coast caused the House of Representatives to create the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina. The committee held "[nine] public hearings, scores of interviews and briefings, and [reviewed] more than 500,000 pages of documents" over five months, before releasing its final report.<sup>7</sup>

To understand what happened and why, the committee had to educate itself on several S&T topics, including telecommunications, levee engineering, weather prediction, and natural disaster prevention and response tools. It found myriad S&T issues at every stage of the response and concluded that, "the preparation for and response to Hurricane Katrina show we are still an analog government in a digital age. We must recognize that we are woefully incapable of storing, moving, and accessing information – especially in times of crisis."<sup>8</sup>

Absent major interventions at a national and global scale—themselves requiring an abundance of S&T knowledge—climate change will cause an increasing number of catastrophic events in the decades ahead.<sup>9,10</sup> Members of Congress and their staff will need to equip themselves with new knowledge and understand new

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7 "A Failure of Initiative - Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina.," x.

8 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, 1.

9 For more on solar geoengineering, a technology to mitigate the global temperature rise from greenhouse gases, see <https://www.belfercenter.org/publication/technology-factsheet-solar-geo-engineering>

10 "Headline Statements from the Summary for Policymakers."

technologies to address sea level rise, wildfires, droughts, heat waves, and more.

Non-climate related disasters, like terrorist attacks, also cause Congress to seek S&T knowledge to pass legislation. In 2001, for example, members of Congress and members of the media received envelopes containing the biological agent anthrax; 22 people were infected, and five ultimately died.<sup>11</sup> The ‘Amerithrax’ attack, as it became known, caused a great deal of fear among the public and led to sustained media attention. In the aftermath of the attack, Congress passed, among other things, the Project Bioshield Act, which allocated funding for researching and stockpiling medical countermeasures like vaccines, and gave “new authorities related to the development, procurement, and use of medical countermeasures against chemical, biological, radiological, and nuclear terrorism agents.”<sup>12</sup>

### 3. National Security

National security is a core focus of Congress, and S&T information has been used to further the United States’ national security interests since before Congress was established.

In modern times, funding from the Department of Defense was crucial to the establishment of Silicon Valley. As Leslie Berlin, a historian at Stanford University, notes, “All of modern high tech has the U.S. Department of Defense to thank at its core, because this is where the money came from to be able to develop a lot of what is driving the technology that we’re using today.”<sup>13</sup>

Congress allocates funding to the Department of Defense, the intelligence community, and other agencies associated with national security. As the nature of national security threats to the U.S. changes, it must seek out S&T information to understand new threats and to learn about promising technologies that could assist

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11 Gottron, “The Project BioShield Act: Issues for the 113th Congress,” 2.

12 Gottron, 2.

13 Dembosky, April, “Silicon Valley Rooted in Backing from U.S. Military.”

in national defense. Because national security will remain core to Congress's responsibilities, its needs for S&T information will continue to increase.

#### 4. National Economic Competitiveness

It is in the United States' national interest to be a global leader in S&T innovation, which enables the country's economy to grow and its people to be more productive. As the World Economic Forum put it, "Basically, rising [economic] competitiveness means rising prosperity."<sup>14</sup>

Congress has a significant role to play in driving S&T innovation through research and development (R&D) funding: it decides how much to appropriate, what the R&D should focus on, and what organizations will do it. According to the CRS, "The federal government has played an important role in supporting R&D efforts which have led to scientific breakthroughs and new technologies, from jet aircraft and the internet to communications satellites and defenses against disease."<sup>15</sup>

U.S. policy has always been driven in part by economic competitiveness. In recent years, though, the competition has gotten fiercer, as China's economy grows larger and the Communist Party of China increases state funding of emerging technology research. In areas of significant competition, like artificial intelligence, the Chinese government is investing tens of billions of dollars at the national and local levels.<sup>16</sup>

As the competition over S&T innovation and market share between the U.S. and the rest of the world continues to increase, Congress's role as an appropriator of R&D funding will become more important. This will likely drive members of Congress to seek out S&T resources to help them understand where and how to deploy R&D funding and business incentives to maximize efficiency and maintain United States' economic competitive edge.

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14 "What Exactly Is Economic Competitiveness? | World Economic Forum."

15 Gottron, "Science and Technology Issues in the 116th Congress," 2.

16 Allen, Gregory, "Understanding China's AI Strategy."

## 5. News Media

News media drives members of Congress to seek out S&T information. Often, members will be asked by the media to comment on an S&T issue that it is reporting on. As one former congressional staffer noted:

“One of the biggest drivers of demand for resources is prepping a member to talk to the press. This is a problem – things are happening all the time and members need to seem like they understand everything and have an answer to everything. You need to have spent hours developing answers to the five questions that might come up in an interview; this takes up a lot of your time.”<sup>17</sup>

This sentiment was echoed by other staffers, who noted that “regular meetings on buzzy items in the news” cause members and senior staffers to ask for additional information on specific S&T topics.<sup>18</sup> Indeed, several staffers used the term “reactive” to describe how member offices act on issues. As one former staffer put it: “More than 80% of what you do on the Hill is reactive,” and “preparing for major news events” is a major driver.<sup>19</sup>

For example, one recent controversy reported on by the news media that spurred congressional action was coverage of how social media platforms like YouTube can harm children.<sup>20</sup> In response, Senator Josh Hawley proposed the Protecting Children from Online Predators Act.<sup>21</sup>

17 Anonymous Congressional Staff Member.

18 Anonymous Congressional Staff Member.

19 Anonymous Congressional Staff Member.

20 Fisher and Taub, “On YouTube’s Digital Playground, an Open Gate for Pedophiles.”

21 Hawley, “Protecting Children from Online Predators Act.”

## 6. Lobbying

Trade associations, advocacy organizations, and corporations are increasingly exerting pressure on Capitol Hill.

According to two researchers, Lee Drutman and Steven Teles, “[Total] Lobbying expenditures have grown...from an estimated \$200 million in 1983 to \$3.24 billion in 2013—a six-fold increase, controlling for inflation.”<sup>22</sup> In 2018, “Clients spent \$3.42 billion on lobbying in 2018, the largest sum since the all-time peak in 2010, according to data from the Center for Responsive Politics.”<sup>23</sup>

This increase is driven in part by technology companies establishing a lobbying presence in Washington, D.C. In recent years, technology firms like Google, Amazon, Apple, and Facebook—sometimes called “The Big Four” technology firms of the Internet age—have significantly increased their lobbying presence on Capitol Hill. For example, Amazon had 12 lobbyists working on its behalf in Washington, D.C. in 2009 and 103 in 2018.<sup>24,25</sup>

**The “Big Four” technology companies have significantly increased their lobbying presence in Washington, D.C.**

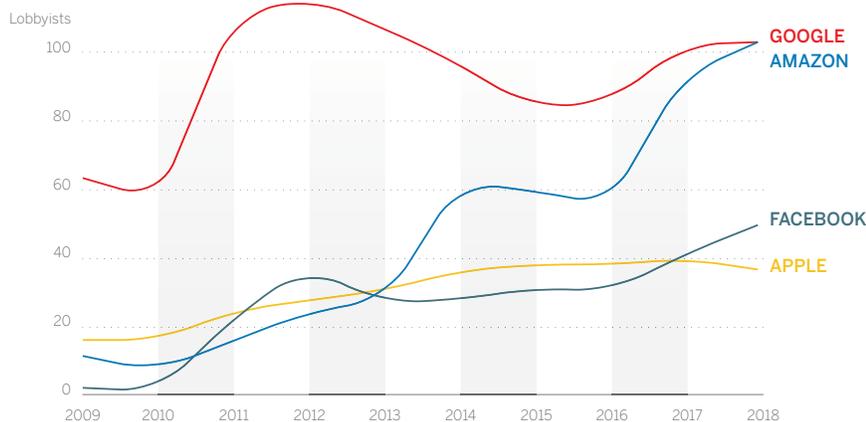


Figure 2. Technology company lobbying.  
Source: Center for Responsive Politics

22 Teles and Drutman, “How Lobbyists Gain the Upper Hand Against Overworked Congressional Staff.”

23 Evers-Hillstrom, “Lobbying Spending Reaches \$3.4 Billion in 2018, Highest in 8 Years.”

24 Tanglis, Mike, “New Economy Titans, Old School Tactics.”

25 This lobbying data comes from the Center for Responsive Politics, which gets its base data from the Senate Office of Public Records. The Center for Responsive Politics is respected for its comprehensiveness, accuracy, and nonpartisanship, and is arguably the most trusted resource for data of this kind. For more, see [opensecrets.org](http://opensecrets.org).

Among the major forces driving congressional S&T demand, lobbyists are unique in that they both drive demand—by arguing for action or inaction on a given topic—and seek to fill it through providing information to Congress.

With technology companies regularly in mainstream news and testifying at congressional hearings, it seems likely that S&T-focused lobbying will only increase.

## 7. American Views and Attitudes

The American public is broadly interested in S&T issues. According to the National Science Foundation’s National Science Board, Americans are more interested in new medical discoveries and the use of new inventions and technologies than they are in economic issues, military and defense policy, and international and foreign policy issues.<sup>26</sup>

**Public interest in the use of new inventions and technologies has increased over time**

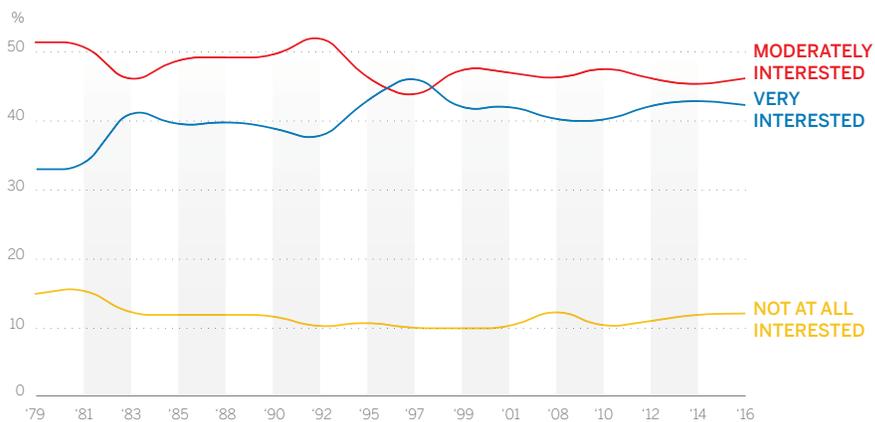


Figure 3. Public interest in science and technology issues.  
Source: National Science Board

26 “Science & Engineering Indicators 2018.”

Interest in these topics has increased over time, and Americans are significantly more interested in the uses of new inventions and technologies than they were a generation ago.<sup>27,28</sup>

Finally, the report notes that, “Overall, the majority of Americans appear concerned about the state of the environment and the degree to which advanced technology areas, such as nuclear energy, genetic engineering, and nanotechnology, may create new dangers and yet remain generally supportive of S&T and scientists.”<sup>29</sup> Concerned Americans will contact their members of Congress, which will spur them to demand S&T information to respond.

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27 Response to the survey question: “There are a lot of issues in the news, and it is hard to keep up with every area. I am going to read you a short list of issues, and for each one I would like you to tell me if you are very interested, moderately interested, or not at all interested: the use of new inventions and technologies.”

28 “Science & Engineering Indicators 2018.”

29 “Science and Engineering Indicators.”

# Localized Forces

In addition to the global and national trends above, there are several localized forces that act on individual members of Congress and their offices, including:

## 1. District/State Pressure

The core of a member of Congress's job is to be responsive to the concerns of his or her constituents, whether at the district or state level. When constituents are engaged in an issue, typically members of Congress are, too.

Constituents care about S&T issues that affect their communities. This is particularly true of individuals who live in districts or states with a heavy S&T focus, like those in Silicon Valley and in areas with large research universities or national laboratories. In these areas, S&T legislation often directly affects their lives and their livelihoods.

Local lobbyists, industry trade association representatives, and non-profit leaders also have vested interests in legislation and oversight. As a current staffer noted, having a major S&T stakeholder in a district or state, like a pharmaceutical company or a medical-device manufacturer, can drive a lot of what the member works on.<sup>30</sup>

Alternatively, if an issue is discussed nationally, constituents may also become interested. If an issue makes the national news, individual constituents may want to offer their views to, or ask question of, their member of Congress.

Multiple current and former staffers noted that, whatever the cause, when interested constituents come to a district office to discuss a piece of legislation or advocate for a cause, the office must pay attention.<sup>31</sup> As one current staffer said, regardless of the source of constituent interest, when staffers get questions from the district, they “need to figure them out as soon as possible,” because

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30 Anonymous Congressional Staff Member.

31 Anonymous Congressional Staff Member.

“members are big on stakeholder engagement and figuring out how they can be helpful.”<sup>32</sup>

It is difficult to quantify the issues that constituents are most interested in; the data that congressional offices collect is not aggregated or available for in-depth research. However, anecdotes from interviews and the survey indicate that, in the S&T space, constituents are currently concerned with data privacy issues in particular.

Additionally, current and former staffers noted that some members are interested in S&T topics for the economic development potential they could hold for their district. Whether a new laboratory or a new private firm, these members believe that bringing S&T initiatives to their district would serve as an economic engine, particularly for low-income areas.<sup>33,34</sup>

## 2. Committee Work/Floor Legislation

Professionally, members often become interested in S&T issues when they sit on a committee related to science and technology—most committees, in one form or another. Multiple current and former staffers noted that committee work causes members to seek out S&T information to prepare for committee hearings, conduct oversight of federal agencies, and to learn about a topic of potential legislative action.<sup>35,36</sup>

Members also become more interested in S&T issues as they take on additional responsibility through a leadership position; multiple current staffers noted that, in a leadership role, members must proactively think about S&T issues.<sup>37</sup>

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32 Anonymous Congressional Staff Member.

33 Anonymous Congressional Staff Member.

34 Anonymous Congressional Staff Member.

35 Anonymous Congressional Staff Member.

36 Anonymous Congressional Staff Member.

37 Anonymous Congressional Staff Member.

### 3. Personal Interest

A member may be interested in an S&T topic because of personal interest, whether due to expertise, a previous career, or pure curiosity. When members are motivated by personal interest, they will often know more about the topic than their colleagues, and care about a particular policy. While not the most-cited demand driver by current and former staffers, some noted that personal interest drives members to proactively seek and use S&T resources.<sup>38</sup>

As noted earlier, many of the broad and localized forces are interconnected and reinforcing. For example, a catastrophic event, like Hurricane Katrina's devastation in 2005, spurs national and district pressure and drives committee work, all of which compels members of Congress to seek out S&T information to make decisions.

Taken together, the broad and localized forces noted above are driving members of Congress to seek out an increasing amount of S&T information; demand is only likely to increase in the future.

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38 Anonymous Congressional Staff Member.



SCIENCE IS ORGANIZED KNOWLEDGE.

### 3. Supply & Engagement: The S&T Resources Congress Has Available to It, and How it Uses Them

*This section is not meant to serve as a comprehensive analysis of all sources of S&T expertise available to Congress; instead, it seeks to offer a broad overview of the various forms that S&T resources available to Congress take.*

As many staffers noted, members of Congress and their teams must serve as the “ultimate generalists.”<sup>39</sup> Broad policy portfolios—from district-specific concerns to matters of national and international import—necessitate similarly broad, but sometimes shallow, knowledge on specific issues. As a result, members and their staffs are heavily reliant on others for issue area knowledge.

This is especially true for S&T topics, as few members arrive in Washington, D.C. with formal technical training or experience.<sup>40</sup> The House of Representatives, for example, is dominated by lawyers and educators, with markedly fewer members with an S&T background.<sup>41,42,43,44</sup>

39 Anonymous Congressional Staff Member.

40 Limited formal experience is not unique to science and technology. The same can be said for issues such as energy and foreign affairs, but what sets S&T apart is the fact that the speed of change and innovation of its policy has historically outpaced the supply of knowledge.

41 Manning, “Membership of the 116th Congress: A Profile.”

42 “Engineers in the United States House of Representatives: 116th Congress.”

43 “Office of the Clerk of the U.S. House of Representatives Library - Membership Profile.”

44 This figure does not include all members of Congress and their backgrounds. For a more comprehensive look at the 116<sup>th</sup> Congress’s makeup, see “Membership in the 116<sup>th</sup> Congress: A Profile” by the CRS.

### Relatively few members of the House of Representatives have science and technology backgrounds



Figure 4. Members of the House of Representatives by selected background  
Source: CRS, House of Representatives

As a result, many members of Congress rely on internal, external, and hybrid sources of S&T information:

- **Internal resources** are those available within the current infrastructure of Congress and include members themselves, their staffs, committee staff, and Congress's associated support agencies: the CRS, GAO, and the CBO. Before its defunding in 1995, the OTA was an internal resource specifically focused on S&T issues.
- **External resources** come from a variety of sources, including the executive branch, international bodies, think tanks, universities, non-profit organizations, industry organizations, and professional associations. These resources provide valuable information not available within Congress, but their authority and utility may be limited by the specific ideological, partisan, or business objectives of the producing organization. External resources may be solicited or unsolicited by those within Congress.
- **Hybrid resources** are models that augment staff capacity by embedding external experts within Congress as policy advisers for a period of time, usually ranging from several months to over a year. Through hybrid resources like fellows and executive branch detailees, Congress can leverage subject matter experts on critical S&T policy issues.

**Congressional staffers report receiving S&T information from many sources, including legislative branch support agencies and other staffers/members of Congress**

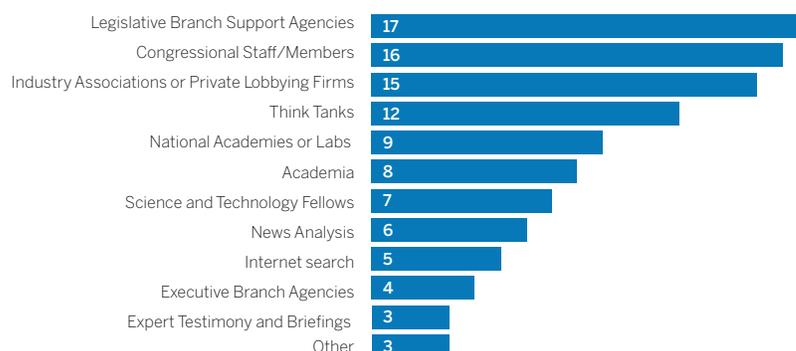


Figure 5. Where congressional staffers obtain S&T information from.  
Source: TAPP Survey

In the survey conducted for this report, current and former congressional staffers noted that some of the most common ways to obtain information were legislative branch support agencies, committee and personal staff, and industry associations (see graph).<sup>45</sup>

One key difference between internal and external resources is whether they are solicited by individuals within the legislative branch or whether they are received unsolicited. Internal resources are often requested by congressional staff members; external resources are often sent, unsolicited, to congressional offices. Congressional staffers interact with external resources in different ways, but a commonality between the resources is that they are usually given, not asked for: a former staffer estimated that about 90% of the resources an office receives are unsolicited.<sup>46</sup>

Another key difference is bias; external organizations may pursue a self-interested agenda. Staffers differed on how they viewed potentially-biased sources. Some argued that part of their job was to account for bias in the information they received, and that it is fine to turn to potentially biased resources, so long as the bias is known and internalized.<sup>47,48</sup> In general,

45 "Congressional S&T Capacity Survey."  
46 Anonymous Congressional Staff Member.  
47 Anonymous Congressional Staff Member.  
48 Anonymous Congressional Staff Member.

both committee and personal office staffers agreed that the more expert and senior a staffer is, the more effectively he or she can account for, and discount, bias in an analysis of information.

Others argue that, particularly for S&T resources, staffers without a technical background may not have the expertise to effectively filter out bias. One individual, a producer of S&T information and a former staffer, argued that many staffers do not know how to account for bias, particularly with issues that do not neatly break down along party lines, like intellectual property, biotechnology, or social media regulation.<sup>49</sup> Other staffers argued that junior staffers have a particularly difficult time filtering out biased resources early in their careers.<sup>50</sup>

Importantly, a former staffer argued that bias can be inherent in the process if there is not time for an office to hear all sides of a debate; the vast majority of meetings a staffer takes are offered, not asked for.<sup>51</sup> In time-constrained situations, this staffer argued, offices may lean too heavily on organizations with sophisticated outreach techniques and the capacity to continually interact with the office.<sup>52</sup>

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49 Anonymous S&T Resource Provider, Interview with Anonymous S&T Resource Provider.

50 Anonymous Congressional Staff Member.

51 Anonymous Congressional Staff Member.

52 Anonymous Former Congressional Staffer.

	TYPE OF RESOURCE	VALUE-ADD TO CONGRESSIONAL STAFF
 INTERNAL RESOURCES	<b>Committee Staff</b>	<b>Evaluators</b> of technical information <b>Connectors</b> of expert networks <b>Decision-Makers</b> on legislation
	<b>Congressional Research Service</b>	<b>Compilers</b> of in-depth literature reviews <b>Historians</b> of past legislative efforts
	<b>Government Accountability Office</b>	<b>Collaborators</b> on research and audits
	<b>Congressional Budget Office</b>	<b>Estimators</b> of policy's budgetary effects
 EXTERNAL RESOURCES	<b>Executive Branch Agencies</b>	<b>Experts</b> on S&T topics and government implementation efforts
	<b>Think Tanks, Academia, and Non-Profit Organization</b>	<b>Educators</b> of research on related S&T topics <b>Trainers</b> on S&T topics and policymaking process <b>Influencers</b> of legislation
	<b>Industry Associations and Lobbyists</b>	<b>Advocates</b> for industry or company viewpoints <b>Trainers</b> on S&T topics <b>Influencers</b> of legislation
	<b>National Academies</b>	<b>Authorities</b> on S&T topics
	<b>National Laboratories</b>	<b>Authorities</b> on S&T topics
 HYBRID RESOURCES	<b>Fellowships and Detailees</b>	<b>Translators</b> of technical information <b>Reality Checkers</b> on received information <b>Educators</b> on S&T issues for internal staff
	<b>Media/Internet Research</b>	<b>Aggregators</b> of timely S&T news

Figure 6. Congress's S&T resources.  
Source: Interviews, Author Analysis

# Internal Congressional Resources

## **Committee Staff**

In interviews, congressional committee staff were consistently referred to as the in-house go-to experts on S&T topics—both by personal office staff and by other committee staff. In other words, most people in Congress rely on committee staff.

As nearly all of the surveyed current or former staffers noted, committees are better resourced than personal offices, which means they can hire staff with more specific expertise than personal offices—and that staff tends to stick around longer.<sup>53,54</sup> Current and former congressional staffers noted using committee staff as **evaluators, connectors, and decision-makers**:

- **Evaluators.** As one former professional staffer on a committee argued, committee staffers are trusted to evaluate information and have valuable opinions on the technical and political merits of it.<sup>55</sup> Often, personal office staff will contact committee staff to ask in-depth questions about a piece of information.
- **Connectors.** As a current fellow noted, personal office staff will reach out to a committee staffer to try to tap into the committee staffer's network of topic-specific experts.<sup>56</sup> A former staffer agreed, saying that committee staffers knew individuals at companies, think tanks, and universities who could provide additional information on specific technical questions to personal offices.<sup>57</sup> In this way, committee staff function as an expert hub, broadening personal office networks.
- **Decision Makers.** Former staffers noted that committee leadership does a significant amount of legislation drafting, making their staffers a sought-after resource for information on the legislation.<sup>58</sup> Not

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53 Anonymous Congressional Staff Member.

54 Anonymous Congressional Staff Member.

55 Anonymous Former Congressional Staffer.

56 Anonymous Congressional Staff Member.

57 Anonymous Congressional Staff Member.

58 Anonymous Former Congressional Staffer.

only are leadership staffers the experts on the legislation, but they also have some ability to change it, making them the go-to resource for information on what the legislation includes and the direction it is likely to be taken.

Recognizing that Congress needs quality, objective information, it has established several research agencies to meet these needs.

*“[Proponents of the Legislative Reference Service] had in mind a situation that confronts every legislative body: the need of data sought out, digested, and brought to bear upon a particular subject.”<sup>59</sup>*  
—Herbert Putnam, former Librarian of Congress

### **Congressional Research Service**

The oldest of the research agencies, the CRS was first established by Congress in 1914 as a new division within the Library of Congress, first as the Legislative Reference Service and later as the CRS.<sup>60</sup> Unique among congressional support bodies, the CRS conducts its work and reports to Congress under a seal of confidentiality, though members or staff are permitted to speak publicly and release reports.

Within the CRS, “the Resources, Science, and Industry Division covers an array of legislative issues for Congress involving ... science and technology,” which includes “policy analysis of general science and technology issues, civilian and military research and development, information technology and communications, and space and earth sciences.”<sup>61</sup> Because S&T knowledge is required for creating products in many other divisions, staffers throughout the CRS work on S&T issues in one form or another.

CRS staff are known for being effective compilers and historians.

59 Putnam, “Legislative Reference for Congress,” 542.

60 Putnam, 542.

61 “Resources, Science and Industry - Congressional Research Service (Library of Congress).”

- **Compilers.** Current and former staffers noted that CRS can quickly develop a comprehensive overview or an in-depth literature review of a topic. While not a full-scale technical assessment, these products are vital in the day-to-day workings of Congress. A former staffer noted that CRS’s foundational documents are particularly useful for junior staffers or staffers lacking an extensive network on a topic of interest to the member.<sup>62</sup>
- **Historians.** Current and former staffers noted that CRS is particularly well suited to provide historical information on a Congress’s previous actions and approaches, due to the tenure of its staff and the institutional knowledge they possess.<sup>63,64</sup>

According to many current and former congressional staffers, because CRS’s staff consists largely of generalists, its reports on S&T policy issues often feature less specific and more surface-level knowledge than those produced by other organizations.<sup>65,66</sup> Furthermore, CRS reports typically arrive at a single consensus or conclusion, which may be less helpful to policymakers considering several potential courses of action.

### **Government Accountability Office**

The GAO is the largest of the three active congressional support agencies, with approximately 3,000 employees.<sup>67</sup> Commonly referred to as the “congressional watchdog,” the GAO examines “how taxpayer dollars are spent and provides Congress and federal agencies with objective, reliable information to help the government save money and work more efficiently.”<sup>68</sup>

In January 2019, the GAO launched a new division—the Science, Technology, Assessment, and Analytics Division (STAA)—to centralize S&T work

62 Anonymous Congressional Staff Member.

63 Anonymous Congressional Staff Member.

64 Anonymous Congressional Staff Member.

65 Anonymous Congressional Staff Member.

66 Anonymous Congressional Staff Member.

67 “Vital Statistics on Congress.”

68 “About the Government Accountability Office: Overview.”

that it had been doing in one form or another since 2002.<sup>69</sup> The STAA has an expansive S&T portfolio that covers issues like artificial intelligence, cybersecurity, and genome editing, and currently employs approximately 70 staffers, with plans to double in size by 2021-22.<sup>70,71</sup>

According to one former staffer, the GAO is a useful **collaborator**, helping to figure out how it can provide information to Congress and developing original data for answering specific questions.<sup>72</sup> Some surveyed staffers argue that the GAO does not have the current staff levels to support Congress in producing more than two or three substantive S&T projects a year, and that its culture may not be amenable to collaboration on S&T issues.<sup>73,74</sup> Several current congressional staffers also noted that GAO staffers are oftentimes viewed as auditors and investigators, and are not top of mind when seeking out background knowledge on S&T issues.<sup>75</sup>

### ***Congressional Budget Office***

Established in 1974 with a mission to “help the Congress make effective budget and economic policy,” the CBO employs a staff of approximately 245 economists and policy analysts to support Congress in the budget process.<sup>76</sup> The CBO was created as an alternative for members of Congress to rely on instead of the executive branch’s Office of Management and Budget. Like its peer congressional support organizations, CBO is highly regarded as an objective, nonpartisan, and expert source of information. In fact, as former CBO staffer and current public policy professor Phillip Joyce notes, “CBO has become such an important tool in holding the executive branch responsive and in checking executive budgetary power that it has positively alarmed some observers.”<sup>77</sup>

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69 WatchBlog, “Our New Science, Technology Assessment, and Analytics Team.”

70 Government Accountability Office, “Technology & Science: Overview.”

71 Mazmanian, “GAO Expands and Elevates Tech Assessment.”

72 Anonymous Congressional Staff Member.

73 Anonymous Congressional Staff Member.

74 Anonymous Congressional Staff Member.

75 Anonymous Congressional Staff Member.

76 “10 Things to Know About CBO | Congressional Budget Office.”

77 Joyce, *The Congressional Budget Office: Honest Numbers, Power, and Policymaking*, 208.



bipartisan nature and expert-driven approach resulted in a general high regard for OTA's work products.

At its height, the OTA relied on a staff of approximately 200, two-thirds of whom were researchers. Eighty-eight percent of the OTA's research staff held advanced degrees and 58% held PhDs in the physical, natural, and social sciences.<sup>80</sup> Apart from its full-time staff, the OTA was empowered to make use of expertise—both inside and outside government—on a contract basis. According to one estimate, 40% of the OTA's staff was made up of professionals on temporary assignments.<sup>81</sup>

The OTA was structured with two main research areas—industry, commerce, and international security, and health, education, and environment—with many subgroup areas. Over the course of its twenty-plus years, the OTA released approximately 750 studies, though it never used its reports to make explicit policy recommendations.<sup>82</sup> Instead, researchers outlined areas of scientific consensus, disagreement, and existing knowledge gaps. The OTA staff assessed various policy options and their consequences, and the OTA experts were made available during congressional hearings and testimonies for follow-up questions and consultations.

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80 Office of Technology Assessment, "Technology Assessment and the Work of Congress: The Assessment Process."

81 Office of Technology Assessment.

82 Houghton, Amo, "In Memoriam: The Office of Technology Assessment, 1972-95."

**CASE: The truth about synthetic fuels: OTA report precludes billions in federal investment in questionable fuel technology**



In the early 1980s, the Carter administration proposed \$86 billion in funding for synthetic fuel generated from coal, fearing an impending scarcity of crude oil and natural gas and a dependence on foreign energy.<sup>83</sup> However, an OTA report published in 1982 concluded that “substantial contributions to oil import reductions from production of synthetic fuels appear to be less certain than substantial contributions from other options” due to high investment costs and significant technological risks.<sup>84</sup>

As a result, Congress changed course and cut over \$60 billion from the proposed synthetic fuel project budget, a figure over 2,000 times greater than the organization’s 1995 budget at the time of its defunding.<sup>85</sup>

In 1995, the OTA was de-funded as part of a broader effort to reduce the size of the federal government—starting with Congress. As Professor Bruce Bimber argues, “OTA was caught up in the ‘Reagan Revolution’ through the effort to balance the budget.”<sup>86</sup> From its early days, the OTA was viewed by some as a partisan vehicle, and it never fully shook that label.<sup>87</sup> It also was, as Bimber notes, “a logical choice given legislators’ desire for symbolic cuts in Congress... ‘Zeroing out’ OTA would allow legislators to advertise that a congressional agency had been eliminated outright.”<sup>88</sup> Other agencies provided support to more customers than the OTA did, making it a comparatively easier agency to cut.

83 Bradley Jr., “The U.S. Synthetic Fuels Corporation.”

84 Bradley Jr.

85 Gedye, “How Congress Got Dumb on Tech—and How It Can Get Smart.”

86 Bimber, *The Politics of Expertise in Congress: The Rise and Fall of the Office of Technology Assessment*, 69.

87 Norman, “OTA Caught in Partisan Crossfire.”

88 Bimber, *The Politics of Expertise in Congress: The Rise and Fall of the Office of Technology Assessment*, 71.

# External Congressional Resources

Interviewees and survey respondents noted that the most commonly used external resources in congressional offices are executive branch staff, think tanks, academia, and non-profits, industry associations and corporate lobbyists, and the National Academies.

## ***Executive Branch Agencies***

Executive branch agencies provide technical assistance on legislation and are a vital component of the drafting process; as one former congressional staffer noted, “almost no law becomes a law without the executive branch agencies weighing in.”<sup>89</sup>

Within agencies, civil service employees have often spent much of their career at one agency, giving them historical depth and an understanding of how to work the bureaucracy. Political appointees are regarded as important points of contact to the broader administration and influencers who understand the administration’s priorities and how to move the bureaucracy towards those ends.

Executive branch agency staff are known as **technical experts** with deep issue-area expertise.

Congressional staff will often seek out agency expertise through an agency’s legislative affairs office or through their own personal networks. Agency staff is particularly helpful for topics requiring specific, niche expertise, and for gaining an understanding of the administration’s broader strategy. As one former staffer put it, “when people want deep expertise, they go to the executive branch.”<sup>90</sup>

However, congressional staffers note that when the legislative branch and executive branch are controlled by different parties, congressional staff is

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89 Anonymous Congressional Staff Member.

90 Anonymous Former Congressional Staffer.

less likely to go agencies for technical assistance, “because it could give away the [legislative] strategy.”<sup>91</sup> In such an environment, congressional staff may turn to other sources of expertise. There are also concerns about, as one former staffer put it, “one branch of government relying on another branch of government” for technical assistance when the branches are supposed to check one another.<sup>92</sup>

### ***Think Tanks, Academia, and Non-profits***

Think tanks are typically privately-funded, non-profit organizations that produce timely reports on a variety of policy areas. According to a University of Pennsylvania analysis, in 2018 the top U.S. think tanks were the Brookings Institution, the Center for Strategic and International Studies, the Carnegie Endowment for International Peace, and the Heritage Foundation.<sup>93</sup> In the same report, the top U.S. think tanks focused on science and technology were the Information Technology and Innovation Foundation, RAND Corporation, and the Institute for Basic Research.<sup>94,95</sup>

Slightly upstream from Congress itself, new fellowship training programs like Aspen’s Tech Policy Hub, which bills itself as a “West Coast policy incubator training a new generation of tech policy entrepreneurs,” have emerged to encourage more S&T experts to consider policy applications of their skills.<sup>96</sup>

Academic institutions are significant sources of S&T policy knowledge. Several host training sessions for policymakers, like Harvard University’s Bipartisan Program for Newly Elected Members of Congress and Stanford University’s Congressional Cyber Boot Camp. Academia is generally viewed to be more objective than most other external sources of knowledge, owing to the academic freedom and intellectual diversity of faculty

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91 Anonymous Former Congressional Staffer.

92 Anonymous Former Congressional Staffer.

93 McGann, “2018 Global Go To Think Tank Index Report,” 78.

94 This list comes from the “Top Science and Technology Policy Think Tanks” category and does not include top think tanks in other categories with a S&T focus, like energy or defense.

95 McGann, “2018 Global Go To Think Tank Index Report,” 151.

96 “Aspen Tech Policy Hub: About the Program.”

and research fellows. However, expertise from academic research centers is perceived as sometimes lacking clear policy implications, requiring time and effort to digest and fully understand.

Many non-profits function similarly to policy think tanks and produce reports, analyses, and fact sheets that touch on key S&T issues.

Individuals within academia and at think tanks and non-profits are widely considered to be **educators, trainers, and influencers**.

- **Educators.** Think tanks, academia, and non-profits can recruit and retain subject matter experts who specialize in issue areas, meaning that they often favor depth over breadth. This allows think tank and university experts to serve as educators for Congress on S&T issues.
- **Trainers.** Many prominent think tanks have offices in Washington, D.C., and use their proximity to Congress to serve as trainers on specific S&T topics. For example, the Wilson Center and Georgetown Law's Institute for Technology Law & Policy are lauded for offering useful discussions and trainings on emerging S&T issues.<sup>97,98</sup> Many congressional districts also house universities, enabling members to receive training in their district or state. Importantly, this training can be on localized, with district- or state-specific information.

Regardless of source, training can take the form of in-person briefings, speaker events, and roundtable conversations. As multiple staffers noted, an important benefit of closed-door trainings is that members feel comfortable asking questions in an off-the-record setting.<sup>99</sup>

- **Influencers.** The unbiased expertise of academics lends them a credibility that congressional offices trust, which makes them influential in the policymaking process. While not unbiased, think tank experts are known for having strong networks and for

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97 "Science and Technology Innovation Program."

98 "Institute for Technology Law & Policy @ Georgetown Law."

99 Anonymous Congressional Staff Member.

understanding the political economy of issues. Taken together, both groups are important influencers of the policymaking process by offering expertise on the policy and politics, and by opening their networks to congressional staff.

### **Industry Associations and Lobbyists**

Industry associations and lobbyists exert pressure on Congress to act—or not act—in ways that support the interests of their members or clients.

Industry and trade organizations unite specific companies, often in the same sector, behind shared interests and speak on their behalf. Examples that are relevant for S&T issues include the Internet Association (IA), Partnership on AI (PAI), Biotechnology Innovation Organization, and Pharmaceutical Research and Manufacturers of America (PhRMA). S&T policy knowledge provided by lobbyists and industry organizations is often non-objective and caters to a specific interest group or perspective.

#### **CASE: Google's lobbying campaign against the Stop Online Piracy Act**



Google has drastically increased its lobbying activity on Capitol Hill in recent years. One prominent example of Google's expanded influence in Washington was its mobilization of the conservative think tank Heritage Foundation, despite general unfriendliness between conservatives and Silicon Valley, against the Stop Online Piracy Act (SOPA) in 2011.<sup>100</sup>

After several encounters in Congress that resulted in Google losing face, the company responded by hiring lobbyists, many of whom were seasoned political operatives on both sides of the aisle. In the buildup to the SOPA vote, Heritage researchers its advocacy branch took up Google's mantle to turn the tide of conservative public opinion against the proposed legislation by framing it as "another government power grab."<sup>101</sup> Shortly afterwards, Google began funding Heritage Action, the think tank's advocacy branch.<sup>102</sup>

100 Hamburger and Gold, "How Google Learned to Stop Worrying and Mastered the Washington Lobbying Game."

101 Hamburger and Gold.

102 Hamburger and Gold.

Within Congress, industry representatives and lobbyists are recognized as experts and, for some, influencers of the political landscape:

- **Experts.** Unsurprisingly, industry representatives are typically experts in their industry. According to a former congressional staffer and former government relations employee for a technology company, the more recent the innovation, the harder it is for Congress to learn about, given the lack of public information.<sup>103</sup> They then turn to industry for the latest information on a new technology or product.
- **Influencers.** According to a former staffer and current producer of S&T information, industry is an excellent resource for understanding the political landscape of an issue and an industry.<sup>104</sup> They also stated that lobbyists and industry associations not only provide self-interested counsel on an issue, but also on how other entities—other members of Congress, local business or advocacy interests, and the public—think about the issue.

### ***National Academies***

The National Academies—which consists of the National Academy of Science, National Academy of Engineering, and the National Academy of Medicine—are private, non-profit organizations that operate under a congressional charter. In order to provide S&T policy capacity to Congress, the National Academies must be contracted by the federal government to perform specific work. For example, the National Academy of Public Administration was contracted by Congress to “conduct a review detailing the current resources within the legislative branch that are available to members of Congress regarding science and technology policy,”<sup>105</sup> which is expected to be released in October 2019.

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103 Anonymous Congressional Staff Member.

104 Anonymous Former Congressional Staffer.

105 National Academy of Public Administration, “Science and Technology Policy Assessment for the U.S. Congress.”

The National Academies task “blue ribbon panels” of expert volunteers with coming up with policy recommendations by consensus; this process lacks significant public or stakeholder input and can take a significant amount of time—often years to produce an authoritative report.<sup>106</sup>

Reports published by the National Academies—approximately 200 each year—are often acknowledged as the **authoritative resource** on a relevant S&T policy issue. Overall, however, the National Academies produce approximately five times more work for executive agencies than for Congress.<sup>107</sup> Even the work destined for Congress must be funded through a federal agency go-between, a point of friction, which can delay the timely flow of knowledge, especially on issues of disagreement between the legislative and executive branches.

### ***National Laboratories***

The federal government operates 17 national laboratories across the country. Administered and overseen by the Department of Energy but largely operated by non-governmental organizations, the national laboratories “tackle the critical scientific challenges of our time—from combating climate change to discovering the origins of our universe—and possess unique instruments and facilities, many of which are found nowhere else in the world.”<sup>108</sup> The United States’ national laboratories have been instrumental in the research, development, and deployment of vital technologies, such as satellite technology, medical diagnostics, and nuclear energy.<sup>109</sup>

Accordingly, national laboratory staff is known for its **deep technical expertise**. However, several congressional staffers note that this expertise is often used more in the executive branch than the legislative branch, as they are.<sup>110</sup> Partly, this is because agencies have a more sustained need for deep technical expertise on a variety of topics over a long period of

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106 Keiper, “Science and Congress.”

107 Keiper.

108 “National Laboratories.”

109 Department of Energy, “75 Breakthroughs by America’s National Laboratories.”

110 Anonymous Congressional Staff Member.

time, whereas Congress often needs this expertise for a brief period of time, when a topic is being considered for legislation. This divide may also simply reflect that national laboratories are administered by an executive branch agency.

### ***Science, Engineering, and Technology Professional Groups***

S&T professional groups include organizations such as the Federation of American Scientists (FAS), the Union of Concerned Scientists, American Chemical Society, and the American Association for the Advancement of Science (AAAS). Some groups, including AAAS and the American Institute of Physics, sponsor the placement of S&T experts in Congress as fellows.<sup>111</sup>

These professional organizations typically have the goal of advancing knowledge of their specific field as well as of current research which may be relevant to S&T policymakers in Congress. One 2009 estimate pegged the number of such professional groups at over 3,000 internationally—a number that is likely to continue growing.<sup>112</sup>

Congressional staffers note that professional groups can be particularly useful resources for staffers with an S&T background who have familiarity with them.<sup>113</sup> The professional groups serve as **network extenders**, able to connect staffers with outside experts on a particular topic.

### ***Non-profit Organizations***

Non-profit organizations that have influence on science and technology policy-making and serve as a knowledge resource such as the American Civil Liberties Union (ACLU), Center for Democracy and Technology, Natural Resource Defense Council, and Demand Progress. Organizations like these provide resources that seek to advance their specific interests in the halls of Congress.

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111 This is discussed in the 'Fellows and Detailees' section below.

112 Stine, "Science and Technology Policymaking: A Primer."

113 Anonymous Congressional Staff Member.

Some non-profit organizations focus on personal offices and committees of members who share their policy positions, and members with different policy positions do not often use their resources. Members of Congress who share policy positions with non-profit organizations often use a non-profit organization's experts to testify at a hearing or to speak at a press conference—**lending expertise and credibility to an argument** the member is trying to make.

Additionally, non-profit organizations offer personal office and committee staff information that is used to craft legislation or to make an argument to their constituents through a press release or through the media. For example, if a member wants to draw attention to an environmental issue, the Natural Resource Defense Council may help craft and amplify the message, with the goal of seeking constituent pressure on other members.

### ***International Nongovernmental Organizations***

Apart from purely domestic resources of S&T policy knowledge, Congress is also able to consult information produced on the world stage, including by international nongovernmental organizations (INGO) like the United Nations, the Organization for Economic Co-operation and Development (OECD), the Organization of American States (OAS), and other development funds such as World Bank.

One example of an INGO with significant relevance to current S&T policy issues is the Intergovernmental Panel on Climate Change (IPCC), a United Nations-sponsored body that “provides regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation.”<sup>114</sup>

Members use S&T resources from INGOs because they are **authoritative** and, for many constituents, lend instant credibility to an argument. For example, members use S&T information from the IPCC to frame the climate debate in public hearings, press conferences, and town halls. IPCC reports are used to justify climate legislation and to explain the impact of inaction. In other words, they are used to attempt to shift the conversation

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<sup>114</sup> Intergovernmental Panel on Climate Change, “About the IPCC.”

around climate change and what action is needed to prevent it from causing catastrophic damage.

Unsurprisingly, members who do not agree with the policy position of an INGO are unlikely to use the S&T resources they offer.

## Hybrid Congressional Resources

### *Fellowship and Detail Programs*

Broadly, fellowship and detail programs place subject matter experts in congressional offices as policy advisors and staffers for a short period, typically lasting from several months to over a year.

This report classifies fellows and detailees as “hybrid” resources because they are, in a sense, both internal and external to the body, though several congressional staffers were quick to note that they are treated like permanent staff.<sup>115</sup> Fellows and detailees come from a variety of diverse backgrounds, including from academia, the private sector, national laboratories, and the military.

While similar in their role in placing external experts inside Congress to advise on key science and technology policy issues, fellowship and detail programs also have several key distinctions between them. Fellowship programs, organized by organizations like the AAAS and TechCongress, operate at a scale that allows them to place fellows in members’ offices and on committee staffs on a recurring basis, while detail positions are generally one-off arrangements.

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<sup>115</sup> Anonymous Congressional Staff Member.

## **Congressional Fellowship Programs**

Three of the most well-known S&T policy fellowship programs that serve Congress are AAAS's Science & Technology Policy Fellowship, TechCongress's Congressional Innovation Fellowship, and the American Institute of Physics's (AIP) Congressional Fellowship Program.

These fellowship programs exist to ensure that lawmakers have the necessary S&T policy knowledge to legislate effectively on important issues. TechCongress and AIP only place fellows in the legislative branch, while AAAS fellows can also serve their fellowships in the executive and judicial branches. AIP places two fellows each year and TechCongress approximately 10, having grown from a class of two in its inaugural class in 2016.<sup>116</sup> AAAS supports over 250 fellows each year, though many of these are placed in federal agencies.<sup>117</sup> Each of the three fellowship programs is externally funded.

### **CASE: TechCongress fellow pokes holes in medical device industry representative's claims**

TechCongress Fellow J.C. Cannon, formerly a Microsoft program manager, worked in 2016 as a staffer on the House Ways and Means Committee. During his one-year fellowship, he was able to add a valuable technology perspective when interfacing with external representatives. In one impactful example he relayed to *Washington Monthly*, Cannon was able to stand up to a special interest lobbyist:



“One issue [Cannon] worked on was for pushing ID numbers for medical devices, so that when a batch of, say, heart valves are defective, the patients who are using them can be notified. An industry representative paid a visit to the committee office, complaining about how hard it would be to implement the IDs. Cannon started asking about what schema and interfaces they were using. ‘What you’re proposing sounds like a day of work, and we can talk through that if you like,’ he told the representative. According to Cannon, the lobbyist got flustered and quickly left.”<sup>118</sup>

This is just one example of how S&T fellows and detailees serve as valuable technical experts for members and their staffs in Congress.

<sup>116</sup> TechCongress, “About the Congressional Innovation Fellowship.”

<sup>117</sup> American Association for the Advancement of Science, “Alumni of S&T Policy Fellowships.”

<sup>118</sup> Gedye, “How Congress Got Dumb on Tech—and How It Can Get Smart.”

Fellowship programs are valuable for sourcing S&T expertise that otherwise is uncommon inside Congress, and for creating on-ramps to serve. The benefits often last beyond the fellowship period; former fellows who transition into permanent policy staff within the federal government augment S&T expertise available to Congress and executive branch agencies. Additionally, many congressional staffers noted that fellows and detailees who return to their original place of work become important nodes in external networks who can offer trusted counsel tailored to the personal office and committee.<sup>119</sup>

According to TechCongress founder Travis Moore, himself a former congressional staffer, the average TechCongress fellow received offers from eight congressional offices, including personal pitches from senators, a display of just how much demand exists for high-quality S&T policy expertise.<sup>120</sup> Similarly, AAAS finds that the number of requests for fellows is twice the number of fellows available.<sup>121</sup>

### ***Congressional Detail Programs***

Detailees also represent an important hybrid source of S&T policy expertise within Congress. Unlike fellowships, detailees often exist because of individual relationships between a member's office and a sponsoring organization. Many detailees are placed using the provisions of the Intergovernmental Personnel Act, which allows for "temporary assignment of personnel between the Federal Government and state and local governments, colleges and universities, Indian tribal governments, federally funded research and development centers, and other eligible organizations."<sup>122</sup>

National laboratories are a common source of detailees in Congress, especially in placing detailees in the offices that represent a laboratory. Other sources include S&T-focused executive branch agencies, such as the

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119 Anonymous Congressional Staff Member.

120 Gedye, "How Congress Got Dumb on Tech—and How It Can Get Smart."

121 Gedye.

122 Office of Personnel Management, "Hiring Information: Intergovernmental Personnel Act."

National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce.

According to a 2017 article in *Legislative Studies Quarterly*, the decline in the number of House and Senate committee staff has been countered in part by a quadrupling of the number of detailees assigned to committee staff.<sup>123</sup> Once in Congress, detailees are usually considered regular staff members.

Due to the funding structure of detailing an individual through the Office of Personnel Management's (OPM) Intergovernmental Personnel Act Mobility Program, detailees are "free" financially for the receiving congressional office.<sup>124</sup> Some detailees are used on longer-term legislative projects while others are tasked with helping members and staff get up to speed on a current issue facing Congress.

S&T-focused fellows and detailees are highly regarded in congressional offices and committees. In interviews, staffers noted that fellows and detailees often add significant value as translators, reality checkers, and educators for other less technical staff.

- **Translators.** A fellow in a congressional office noted that having someone with a technical background in an office that represents a national laboratory is valuable to translate 'lab-speak' for the member and office staff.<sup>125</sup> This ability to translate S&T knowledge into something understandable to a non-expert group is valuable, especially in offices that consistently deal with S&T issues or stakeholders.
- **Reality Checkers.** Fellows also serve in a reality-checking role. As an independent evaluation of the TechCongress fellowship program conducted by David Shorr noted, "fellows and supervisors alike reported how helpful it is to draw on the expertise of the fellows

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123 Mills and Selin, "Don't Sweat the Details! Enhancing Congressional Committee Expertise Through the Use of Detailees."

124 Office of Personnel Management, Intergovernmental Personnel Act Mobility Program: <https://www.opm.gov/policy-data-oversight/hiring-information/intergovernment-personnel-act/#url=Provisions>

125 Anonymous Congressional Staff Member.

as a reality-check” in private meetings with stakeholders.<sup>126</sup> This helps, for instance, prevent an interested S&T party from unduly influencing an office through wielding jargon or expertise; a fellow may be able to see through the ploy. Finally, a former member of Congress noted that fellows can help offices understand whether the root cause of a disagreement is based in science or politics—cutting through partisanship, for example, when an issue is really a scientific or technical question.<sup>127</sup>

- **Educators.** As an outside expert on Congress put it, one of the values of fellows is proximity; if a staffer has an S&T question, he or she can just ask the fellow in the office, rather than search for an answer through other means. If the fellow does not know the answer, they often have other external contacts that they can ask, expanding the pool of available knowledge for an office.<sup>128</sup>

Another significant benefit of fellowships and details is that they allow scientists and technologists to help a personal office or committee with a specific technical topic without needing to share ideology on other topics. As one current committee staff member noted, “it is one thing to have a fellow that advises on one issue...it is another to hire a person that is political opposite of the member.”<sup>129</sup> Other current staffers noted that this is more of an issue for Republican members than for Democrat members.<sup>130</sup>

However, staffers noted that using fellows or detailees often comes with some drawbacks.

First, as many noted, the fellowship and detail periods are often quite short, and several staffers noted that it takes time to train new staff on how to effectively work in Congress.<sup>131</sup> As Shorr put it, “to varying degrees, fellows arrive on Capitol Hill as strangers to the entire realm of policymaking,” and staffers note that time-strapped offices must invest time in bringing fellows up to speed, which can be a significant responsibility for time-strapped

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126 Shorr, “TechCongress and Public Interest Technology,” 6.

127 Anonymous Former Member of Congress, Interview with Anonymous Former Member of Congress.

128 Anonymous Congressional Staff Member.

129 Anonymous Congressional Staff Member.

130 Anonymous Congressional Staff Member.

131 Anonymous Congressional Staff Member.

staffers.<sup>132,133</sup> One former staffer noted that details also draw resources away from executive branch agencies, which temporarily under-resources the executive branch.<sup>134</sup>

Another potential drawback is that fellows and detailees may be perceived as too specialized to adapt to a different topic; as a former committee staffer noted, sometimes those with a technical background lack the agility of a generalist staff person.<sup>135</sup> Multiple people noted that congressional staffers are spread thin and must be “a mile wide and an inch deep,” and technical experts tend to be the reverse.<sup>136,137,138</sup> S&T-focused fellows may also prefer to work on their specific area, rather than have a broader portfolio.

Finally, fellowships and details are, by their nature, models to bring people in, train them and leverage their expertise, and send them back. Fellows and detailees gain tacit knowledge about how Congress works and how to be effective within it, then leave; new talent then comes in and starts the process anew. Recognizing this, the evaluation of TechCongress notes that the organization’s goal is to, essentially, become obsolete: “TechCongress’s theory of change is that demonstrations of effective staffing on technology policy issues will convince congressional offices to create positions devoted to these portfolios.”<sup>139</sup>

## **Media/Internet Research**

The news media is a vital source of S&T information for Congress. When paired with personal office or committee staff conducting internet research, it serves as an important means of quickly learning about an S&T issue in the news.

Given time constraints in personal offices and committees, staffers value information that is current, easy to understand, and accessible. The news

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132 Shorr, “TechCongress and Public Interest Technology,” 8.

133 Anonymous Congressional Staff Member.

134 Anonymous Congressional Staff Member.

135 Anonymous Former Congressional Staffer.

136 Anonymous Congressional Staff Member.

137 Anonymous Congressional Staff Member.

138 Anonymous S&T Resource Provider, Interview with Anonymous S&T Resource Provider.

139 Shorr, “TechCongress and Public Interest Technology,” 3.

generally meets all of these criteria; as one current staffer noted, “newspaper articles are the most up-to-date and the easiest to access.”<sup>140</sup>

Another benefit of the news is that it attempts to summarize complicated topics in terms that the average reader can understand—something that is even more important for junior staffers who are not experts on a topic.

Other current and former staffers noted that the news served as effective **aggregators** of timely S&T news, enabling them to quickly put together background policy documents for members.<sup>141,142</sup>

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140 Anonymous Congressional Staff Member.

141 Anonymous Congressional Staff Member.

142 Anonymous Congressional Staff Member.



## 4. Bridging the Divide: Actions to Improve Congressional S&T Capacity

*“There is no silver bullet—it’s a funding issue, it’s an expertise issue, it’s an institutional issue in terms of time and ability to focus on the issue.”<sup>143</sup>*

*—Current Congressional Staffer*

When the news media reports on a S&T-related scandal—such as Cambridge Analytica’s misuse of data provided by Facebook—personal offices seek S&T information that will help them quickly understand the situation and its implications. A personal office might task a staffer with doing desk research or asking a committee staff member a few questions; this information helps the office prepare for immediate media requests or to help it put out a rapid press release.

Personal or committee staff might then seek out information on previous social media- or data privacy-focused legislation by asking the CRS to compile a report. This would take a bit longer but offer a more in-depth understanding of what has been done before, which could inform potential legislation drafted by a member on the committee.

Finally, a committee may seek out a comprehensive report on social media regulation, completed by experts and inclusive of various policy options. This report could take months to complete, so it would not help with the initial reaction and response to the scandal—but by going deep into the topic, it would inform members for future hearings and legislation.

In other words, Congress has greatly varying needs for S&T information. Sometimes, it needs specific information right away; other times, it needs an expansive resource that is informed by multiple experts, but is less time-sensitive.

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<sup>143</sup> Anonymous Congressional Staff Member.

This section analyzes the extent to which various S&T resources meet Congress's needs. Then, it identifies gaps between what Congress has available to it and what it can absorb, before offering actions that would help close the gaps.

### ***Actions to Improve Congress's Ability to Incorporate S&T Information into its Decision-Making Processes***

Despite the quantity of S&T resources available to Congress, significant gaps remain that hinder it from producing timely, thoughtful, and comprehensive legislation on S&T issues.

**At the heart of the problem is a divide between the type of resources Congress can absorb and what it has available to it.**

On the internal side of the divide, Congress has simply not given itself the human capacity and funding necessary to efficiently and effectively absorb new information—particularly for complex S&T topics.

On the external side of the divide, while Congress is inundated with resources, it often does not have information that fits its needs. Sometimes, the messenger is biased; other times, the message is difficult to translate into policy actions.

## Bridging the Divide: Actions to Increase Congress's S&T Capacity

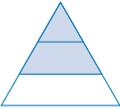
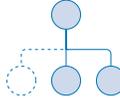
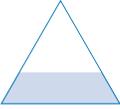
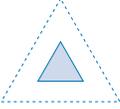
GAPS	ACTIONS
	<p><b>INSTITUTIONAL SUPPORT GAP</b></p> <p>Congress does not have a support body exclusively focused on S&amp;T issues to provide objective, in-house consultation.</p> <p><b>CREATE A CONGRESSIONAL SUPPORT AGENCY THAT IS</b></p> <ul style="list-style-type: none"> <li><b>Embedded</b> within Congress to ensure 'shared staff' approach</li> <li><b>Able to incorporate</b> all external perspectives</li> <li><b>Structured</b> to be adaptable to the changing needs of Congress</li> <li><b>Options-oriented</b> to give Congress multiple policy options</li> </ul>
	<p><b>S&amp;T TALENT GAP</b></p> <p>Congress lacks robust recruiting pathway for diverse S&amp;T talent.</p> <p><b>REEVALUATE PROCESS FOR FINDING S&amp;T TALENT BY</b></p> <ul style="list-style-type: none"> <li><b>Creating Paths for Undergraduates Pursuing S&amp;T Majors to Come to Capitol Hill.</b> Congress, universities, and foundations should work together to encourage S&amp;T students to work on Capitol Hill.</li> <li><b>Reimagining Talent Pathway to Encourage S&amp;T Hires.</b> Create a mid-career pathway to enable S&amp;T experts to work for Congress at level commensurate with their experience.</li> <li><b>Expanding Policy Training.</b> Ensure that S&amp;T experts can be effective congressional staff members</li> </ul>
	<p><b>INTERNAL RESOURCING GAP</b></p> <p>Congress does not give itself the resources to hire enough people with the right skillsets.</p> <p><b>ADDRESS STRUCTURAL GAPS BY</b></p> <ul style="list-style-type: none"> <li><b>Investing in Itself.</b> Increase the resources available to personal offices, committees, and support agencies.</li> </ul>
	<p><b>EXTERNAL RESOURCES GAP</b></p> <p>While many consider Congress the "most advised body in the world," many of the resources available are less useful than they could be.</p> <p><b>EXTERNAL RESOURCE PROVIDERS SHOULD</b></p> <ul style="list-style-type: none"> <li><b>Offer Customized, Concise, and Timely S&amp;T Information.</b> Congressional staffers highlight these attributes as particularly important.</li> <li><b>Build Relationships with Offices Over Time.</b> A consistent relationship will help ensure that a message is heard by the office.</li> </ul>

Figure 7. Actions to increase Congress's S&T capacity.  
Source: Interviews, Author Analysis

# Institutional Support Gap

While many internal resources are available to Congress, none are focused specifically on understanding and explaining S&T issues.

Existing staff members at the CBO and CRS are highly sought after for budgetary and research assistance but are not generally perceived as authorities on S&T issues. As noted earlier, current staffers stated that while the GAO “wants to provide briefings for members...they may not have the right staff,” and that the STAA can only complete an estimated two or three extensive S&T projects a year.<sup>144</sup> Many current staffers also point to the GAO’s culture as a potential barrier to effective authoritative resource on S&T issues.<sup>145</sup>

**Action:** Create Congressional Support Agency Focused on S&T Issues

*“A well-funded agency whose sole purpose is advising Congress on technology issues, free from the influence of corporate and special interests, is absolutely necessary.”<sup>146</sup>*

*—Representatives Mark Takano and Sean Casten*

Such a support agency would:

- **Exist Within Congress.** An S&T support agency should be created inside Congress. While some experienced current staffers argued that this is less important for them, given the network they had already developed, many current and former staff members, along with outside experts, noted how onsite expert ‘shared staff’ members—like those of CRS—are valued by committees and personal offices.<sup>147,148</sup> ‘Shared staff’ are treated as trusted colleagues who can be relied on for subject-matter expertise on a broad array of S&T topics, and a new agency should attempt to create this relationship for both personal offices and committees.

<sup>144</sup> Anonymous Congressional Staff Member.

<sup>145</sup> Anonymous Congressional Staff Member.

<sup>146</sup> Takano and Casten, “Why Congress Needs The Office Of Technology Assessment More Than Ever.”

<sup>147</sup> Anonymous Congressional Staff Member.

<sup>148</sup> Givens and Fluitt, “Improving Tech Expertise In Congress: Time to Revive OTA?,” 11.

- **Convene Groups of Diverse Stakeholders.** Rather than rely only on in-house expertise for information gathering and analysis, the support agency should be informed by a broad group of diverse stakeholders—not just scientists and technologists, but consumers, advocacy organizations, ethicists, vulnerable populations and more. In other words, the technology assessment process should be more inclusive to represent a greater diversity of experts and those impacted by potential decisions. This new body’s reports should be subject to external peer review, as well, to ensure comprehensiveness and a sense of authority.
- **Serve Multiple Congressional Needs.** Sometimes, Congress will need a long, exhaustive report about a new technology. Other times, though, a personal office or committee may need a time-sensitive policy brief or consultation. An S&T support agency should be able to serve both types of needs, with products tailored to the customers’ needs.
- **Be Options-Oriented.** Rather than give an answer, or elide options altogether, this body should give data-driven policy options. Many current staffers indicated trepidation about a nonpartisan body offering policy options—some of which would no doubt be interpreted through a political lens.<sup>149</sup> However, they also argued that the best S&T information they received was options-oriented. Taken together, the benefits of the body offering specific policy options outweighs the potential cost.

Partly fulfilling the above criteria, the 116<sup>th</sup> Congress is taking steps towards re-funding the OTA. In May 2019, the Committee on Appropriation’s Legislative Branch Sub-Committee released its FY2020 appropriations bill, which proposed allocating \$6 million to the OTA.<sup>150</sup> The bill argues,

“A re-opened OTA will play an important role in providing accurate, professional, and unbiased information about technological developments and policy options for addressing the issues those developments

149 Anonymous Congressional Staff Member.

150 Committee on Appropriations, “Legislative Branch Appropriations Bill 2019,” 3–4.

raise. In that role, OTA will complement the work of the Government Accountability Office in the area of science and technology.”<sup>151</sup>

Later, the bill argues that in the years since the OTA was de-funded, “it has become increasingly clear that Congress does not have adequate resources available for the in-depth, high level analysis of fast-breaking technology developments and their public policy implications that was formerly provided by OTA.”<sup>152</sup>

Members of Congress, like Mark Takano and Sean Casten, argue that re-funding the OTA would be valuable for Congress, because “the OTA’s role is to chart the way forward by generating new knowledge that answers those questions and fills those gaps.”<sup>153</sup>

However, many argue that re-funding the OTA will not be enough—that the organization needs to adapt to the current environment. The SCMC, for example, unanimously passed a recommendation for “reestablishing and restructuring an improved Office of Technology Assessment,” which may be re-named the “Congressional Technology and Innovation Lab.”<sup>154,155</sup> Many argue that the ‘new OTA’ should produce a broader set of products—everything from short on-demand memos to its traditional exhaustive reports—and that it should cater to a broader group of customers, including individual offices.

Alternatively, some current staffers argue that Congress already has several internal and external resources available to it to fulfill its S&T needs, and it therefore does not need, as one put it, a “redundant” S&T-focused support body.<sup>156</sup> Instead, some argue, the S&T capacity of the CRS or GAO should be bolstered.<sup>157</sup>

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151 Committee on Appropriations, 3–4.

152 Committee on Appropriations, 17.

153 Takano and Casten, “Why Congress Needs The Office Of Technology Assessment More Than Ever.”

154 Select Committee on the Modernization of Congress, “Select Committee Unanimously Approves Second Round of Congressional Recommendations | Select Committee on the Modernization of Congress.”

155 Davis, “Select Committee on Modernization Approves Technology Recommendations from Davis and DelBene.”

156 Anonymous Congressional Staff Member.

157 Anonymous Congressional Staff Member.

The discussion on whether and how to create a new legislative support body focused on S&T issues will continue. The National Academy of Public Administration (NAPA) was tasked by Congress and the CRS with “[conducting] a review detailing the current resources within the legislative branch that are available to members of Congress regarding science and technology policy.”<sup>158</sup> Its report is expected in late 2019. The Committee on Appropriation’s Legislative Branch Sub-Committee is set to take up its appropriations bill in September 2019.

## S&T Talent Pathway Gap

### **Congress does not hire enough staff with S&T backgrounds.**

While Congress does not need experts in all S&T-relevant fields and sub-fields to effectively legislate and conduct oversight on S&T issues, there remains an overarching technical expertise and talent gap within personal offices and committees.

There are structural challenges that make a S&T-focused career in Congress unusually difficult. Due to budget constraints and the nature of the role, staffers are usually generalists. Often, this is exactly what is needed; as one producer of S&T resource noted, staffers usually need to understand broadly how a technology works, but do not necessarily need to be an expert.<sup>159</sup>

Other times, though, a lack of in-house expertise puts congressional offices at a disadvantage. As David Shorr wrote about the TechCongress Innovation Fellows:

“Staffers’ meetings with stakeholders in the privacy of their offices are a noteworthy match for the skills of the Innovation Fellows. These are settings in which the fellows—with their special insight into the practical workings of technology—can perform valuable service as polite-but-firm [lie] detectors. Whether the visitor has

<sup>158</sup> National Academy of Public Administration, “Science and Technology Policy Assessment for the U.S. Congress.”

<sup>159</sup> Anonymous S&T Resource Provider, Interview with Anonymous S&T Resource Provider.

been invited to come in for the purpose of being grilled or instead requested the meeting as part of a lobbying effort, fellows and supervisors alike reported how helpful it is to draw on the expertise of the fellows as a reality-check.”<sup>160</sup>

Career progression in Congress also puts those with an S&T background—often with a PhD— at a disadvantage. As a current staffer noted, congressional offices often hire from within Congress; staffers typically start as interns who work their way up over time. In other words, the hiring process is not designed for subject matter experts with years of scientific training.<sup>161</sup> Because of this and other barriers, one agency leader estimated that approximately 5% of members of Congress have staffers in their personal offices with an S&T background.<sup>162,163</sup>

Fellowships can help bolster existing resources and serve as means of bringing in new talent with up-to-date experience. However, as noted earlier, when a fellow leaves, tacit knowledge about Congress and how it works leaves with him or her. Detailees offer a similar value proposition with a similar downside.

In creating on-ramps into Congress, both types of placement programs offer expertise to offices, often for free—but they create off-ramps out that contribute to institutional memory depletion.

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160 Shorr, “TechCongress and Public Interest Technology,” 6.

161 Anonymous Congressional Staff Member.

162 Anonymous S&T Resource Provider, Interview with Anonymous S&T Resource Provider.

163 It is difficult to collect data on the current and former education backgrounds of all Congressional staffers, though this estimate is directionally correct, based on plausibility checks with current and former staffers.

*“The central question should not be how we make members of Congress smarter; instead, it should be how we get good technical staff in each office.”<sup>164</sup>*

*—Former TechCongress Fellow*

Fellowship organizations like TechCongress have shown the value of having additional experienced scientists and technologists on committees and in personal offices. Congress should actively solicit S&T fellows and increase the number it uses.

Congress should also adopt a modernized staffing model that brings technical talent into personal offices and committees on a permanent basis. This would allow Congress to capture the technical expertise of the individuals and the policymaking skills gained through time working on Capitol Hill.

To do so, Congress should:

**1. Build pathways for S&T undergraduates to learn about opportunities on Capitol Hill.**

Congressional hiring pathways often begin at the undergraduate internship level; as one current staffer noted, strong unpaid interns become full-time entry-level employees, who then are promoted from within to more senior positions.

Recognizing this reality, Congress and universities should work together to ensure that computer science and engineering students recognize policy work as a potential career. Congress should seek out undergraduates pursuing S&T majors and get them working on Capitol Hill through internships and fellowships; not only will this help build a pathway to service, but it would also bolster S&T capacity.

Creating this pathway will require congressional offices to broaden their networks to ensure that they have access to this group of

<sup>164</sup> Anonymous Congressional Staff Member.

traditionally non-traditional hires. Leaders of science and engineering schools should highlight opportunities in Congress to their students, many of which are likely unaware of opportunities on Capitol Hill. They should be creative about offering credit for “semesters abroad” in Washington, D.C., too.

Congress, universities, and foundations should work together to ensure that these Capitol Hill opportunities are paid—they will be competing with the private sector to recruit S&T students.

**2. Better promote congressional career opportunities within experienced technical communities.**

Congress should also **reevaluate its pathway for experienced hires**. This will require modifying traditional hiring practices; individuals with PhDs do not want to start as unpaid interns. Fellowships are one path to hiring experienced technical talent into permanent staff positions; Congress should look at others, as well.

One of the virtues of Congress’s traditional hiring process is that it weeds out those who are not a good fit for the institution. However, Congress can also take steps to better prepare mid-career hires with S&T backgrounds for success in policymaking roles through training and mentorship opportunities. Internally, Congress can rely on the CRS to provide a tailored institutional curriculum to newly hired scientists and technologists on staff. Externally, Congress can look to academia, think tanks, non-profits and foundations to offer additional training resources.

To be sure, creating new pathways for mid-career experts to work on Capitol Hill and making space for them to be successful will be a culture shift for a legislative branch long reliant on generalist talent. Staffers acknowledge, though, that the reward is likely worth the effort.<sup>165</sup>

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<sup>165</sup> Anonymous Congressional Staff Member.

# Internal Resourcing Gap

**Congress faces several structural issues that constrain its ability to do its job.**

Congress does not give itself the human capacity and funding necessary to be an effective co-equal branch of the federal government. In fact, it has taken away resources from itself even as its job gets more difficult.

In short: members are not allocated the funding to hire experienced, expert personal staff; committee staff has been significantly reduced; support agency staff has been slashed or, in some cases, eliminated altogether.

## **Member Personal Offices**

All members of Congress are allotted an amount of money “to support them in their official and representational duties,” referred to as the Members’ Representational Allowance (MRA) and the Senators’ Office Personnel and Office Expense Account (SOPOEA) for representatives and senators, respectively.<sup>166</sup> In FY2018, the average MRA was \$1,368,520, and the average SOPOEA was \$3,467,971.<sup>167,168</sup>

In recent years, representatives have used roughly 75% of their MRA on personnel compensation, and offices are limited to a maximum of 18 permanent personnel total staff, who must support the representative in both Washington, D.C. and their home district.<sup>169,170,171</sup> In 2018, this meant that if the typical representative wanted to hire the maximum number of staff, they could offer approximately \$57,000 per employee per year—relatively low pay for professionals working in Washington, D.C. They can, of course, raise pay to attract senior staff, but would have to reduce the compensation

<sup>166</sup> Brudnick, “Congressional Salaries and Allowances: In Brief,” 1.

<sup>167</sup> Brudnick, 1.

<sup>168</sup> Neither the MRA nor the SOPOEA includes the salary of the elected official. The MRA varies from Representative due to varying funding levels for office expenses and mail allowances.

<sup>169</sup> Brudnick, “Members’ Representational Allowance: History and Usage,” 14.

<sup>170</sup> Members can also allocate portions of their MRA to part-time staff, and were allocated up to \$20,000 per office for intern compensation in FY2019 appropriations.

<sup>171</sup> Leadership—including the Speaker of the House, Majority Leader, and Minority Leader—have additional staff. Total leadership staff was 50% higher in 2015 than it was in 1995.

of lower-level employees to make up the difference. Personal offices could also hire fewer staff and pay each one more, but the amount of work an office needs to do, in Washington D.C. and at home, remains the same.

Lower salaries also make it more difficult to hire S&T talent that could make substantially more outside of Capitol Hill. As one current staffer put it, this makes hiring individuals with specific expertise difficult: “Money is really the issue. You can’t afford the people who know enough to know what you don’t know.”<sup>172</sup>

Total committee staff has decreased from 3,575 in 1979 to approximately 2,213 in 2015, a reduction of 38%.<sup>173</sup> Much of the decline came in the mid-1990s, when the majority party chose to reduce congressional spending:<sup>174,175</sup>

**Congressional committee staff has decreased over time**

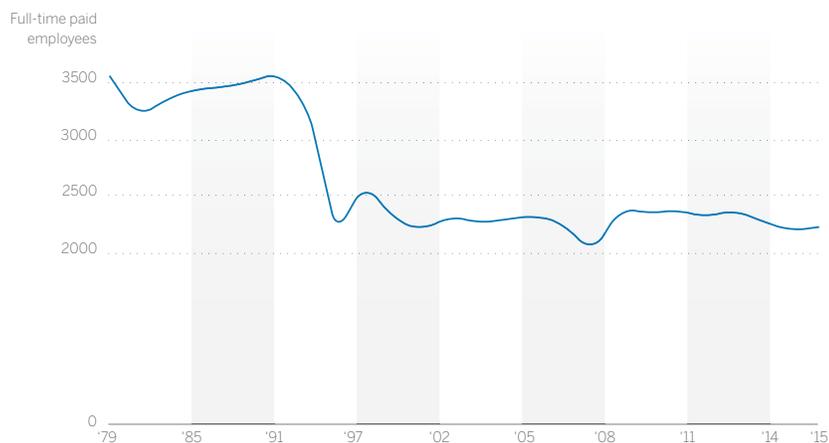


Figure 8. Congressional committee staff over time.  
Source: Brookings Institution

Similarly, legislative branch support agencies have faced dramatic staffing reductions. In 1979, the support agencies had 6,499 staff, compared to 3,833 in 2015—an overall decrease of 41%.<sup>176</sup>

172 Anonymous Congressional Staff Member.

173 “Vital Statistics on Congress.”

174 “Vital Statistics on Congress.”

175 US Senate staffing figures are not available for 2010. Rather than leaving a gap in the graph, we simply used 2009 staffing figures as a proxy estimate to show staffing over time.

176 “Vital Statistics on Congress.”

### Legislative branch support agency staff has decreased over time

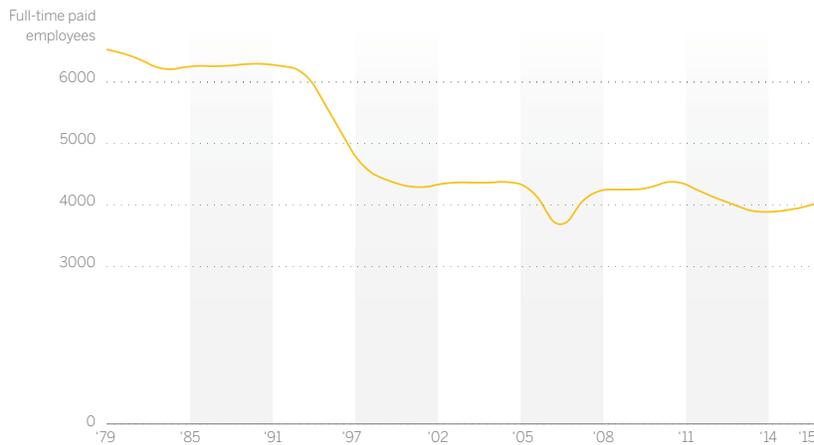


Figure 9. Legislative branch support agency staff over time.  
Source: Brookings Institution

**Taken together, this reduces Congress’s absorptive capacity**—its ability to ingest and use new information.<sup>177</sup> And without in-house expertise, personal offices and committees turn to outside sources for issue knowledge and legislative assistance.

#### **Action:** Congress Should Invest in Itself

*“You get what you pay for. If you care about a Congress that is the First Branch, the preeminent branch, you support it that way.”<sup>178</sup>*

*—Representative Pascrell Jr.*

**Congress should invest in itself.** Congress should increase committee and support agency budgets to allow them to hire additional staff. To enable members of the House of Representatives to recruit and retain qualified staff, it should raise the MRA and remove the cap on office personnel. Congress should also increase the ceiling on staff pay, which will necessitate increasing member pay.

177 For more on the concept of absorptive capacity, see Tudor and Warner, *The Congressional Futures Office*.

178 Pascrell Jr., Bill, Testimony Before the Select Committee for the Modernization of Congress.

Partly to grapple with these issues, in January 2019, House leadership created the Select Committee on the Modernization of Congress (SCMC). The SCMC was given a mandate to, among other things, “develop recommendations on modernizing Congress, including recommendations on... technology and innovation” and “staff recruitment, diversity, retention, and compensation and benefits.”<sup>179</sup>

The SCMC has held multiple hearings and solicited recommendations from current and former House Representatives and congressional experts. Representative Katherine Clark, for example, offered a strong argument for reform:

“Under our constitutional system, Congress represents the first branch of government, the branch from which all government power emanates. And yet, we have allowed ourselves to be reduced to an inferior, even occasionally subordinate, branch to the executive. This is because for decades Congress has slowly but surely eroded our capacity to serve as a co-equal branch of government... Simply put, we don’t have enough staff to do our jobs, and the staff we do have are underpaid and don’t stay very long”<sup>180</sup>

Representative Clark offered several recommendations to improve retention, such as increasing staff salaries and offering additional family benefits.<sup>181</sup>

The SCMC has limited power; it cannot introduce legislation, and is authorized for only 2019.<sup>182</sup> Unlike other committees, the SCMC requires the support of a supermajority of two-thirds of its members to produce recommendations and its final report.<sup>183</sup> However, it has already passed 29 unanimous recommendations, ranging from adopting a standardized format of drafting legislation to raising the cap on the number of staff in member offices.<sup>184,185</sup>

179 Hoyer, “House Resolution 6: Adopting the Rules of the House of Representatives for the One Hundred Sixteenth Congress.”

180 Clark, Katherine, Testimony Before the Select Committee for the Modernization of Congress.

181 Clark, Katherine.

182 Drutman, “Can Congress Fix Itself?”

183 Hoyer, “House Resolution 6: Adopting the Rules of the House of Representatives for the One Hundred Sixteenth Congress.”

184 Select Committee on the Modernization of Congress, “Select Committee Unanimously Approves Second Round of Congressional Recommendations | Select Committee on the Modernization of Congress.”

185 For a history of past congressional reform efforts, see a 2015 Congressional Institute brief: [http://conginst.org/wp-content/uploads/2015/10/brief\\_history\\_reform\\_committees.pdf](http://conginst.org/wp-content/uploads/2015/10/brief_history_reform_committees.pdf)

To be sure, there are legitimate concerns that simply increasing personal office funding will not lead to additional S&T-focused hires; as multiple current committee staffers noted, personal offices would likely prioritize hiring individuals who could help with politically-focused tasks, rather than S&T-focused ones; reelection is the most salient concern. They did note, however, that committees would use additional funding to recruit and retain S&T talent.<sup>186</sup>

It is also true that it is politically difficult for members to raise their own pay, and members will not want their staff to make more than they do. In other words, there are no easy options to meet this recommendation. Change—particularly politically unpopular change—is hard. House leadership of both parties will need to work together to make this happen if it is to succeed.

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<sup>186</sup> Anonymous Congressional Staff Member.

## External Resource Gap

While Congress is inundated with resources, it often does not have external information that fits its needs. As noted earlier, Congress has a range of needs that it seeks S&T resources to fulfill, ranging from immediate fact checking to broader examinations of technologies and their societal implications.

One current staffer put it succinctly: “People coming in to offer recommendations do not have the legislative experience to provide the most useful advice for members and their staff.”<sup>187</sup>

**Action:** *External resource providers should seek to produce information in the format Congress values and can act on.*

*“Having resources that are tailored to an individual member is a good way to have them pay attention.”<sup>188</sup>*

*—Current Congressional Staffer*

Multiple current and former staffers argued that overall, the most consistently useful external written resources they received were:

- **Short and Concise.** staffers overwhelmingly argued for short, concise high-level summaries on a topic, rather than long, dense reports; they noted that strong briefs typically take a ‘bottom line up front’ approach.<sup>189</sup> Information that is too detailed or dense may not be understood or absorbed, particularly by staffers without a background in the issue.
- However, current and former staffers also note that additional detail should be provided, to allow those with the time or interest to read more.<sup>190,191</sup>

<sup>187</sup> Anonymous Congressional Staff Member.

<sup>188</sup> Anonymous Congressional Staff Member.

<sup>189</sup> Anonymous Congressional Staff Member.

<sup>190</sup> Anonymous Congressional Staff Member.

<sup>191</sup> Anonymous Congressional Staff Member.

- **Customized for the Audience.** Staffers argued for including a section on how a given topic affects that member’s district or state, and that statistics and useful graphs often help members and staff remember and use the information.<sup>192</sup> When available and germane to the conversation, a former staffer noted, the economic impact of a policy for a given constituency should be noted.<sup>193</sup>
- **Consistent.** According to a current staffer, the most effective advocates for any issue, including S&T issues, consistently interact with the office, building a relationship over time.<sup>194</sup> Rather than coming in once and giving information, effective advocates are in continuous contact with the office by sending follow-ups and developing relationships with the staffers. As a current staffer noted, doing so serves as a reminder to the office and keeps it thinking about the issue.<sup>195</sup>
- **Timely.** A producer of S&T resources noted that time is a significant factor for congressional offices, and that being able to offer a quick answer—that they can trust— on short notice is rewarded.<sup>196</sup>

Several current and former staffers noted that the Information Technology and Innovation Foundation (ITIF) offers exceptional S&T resources for Capitol Hill.<sup>197,198</sup> A representative briefing the ITIF offers is relatively short, uses non-technical language and graphics to explain concepts and facts, and gives a bottom line that time-strapped staffers can quickly scan.<sup>199</sup>

Of course, not all external resources should have the above characteristics. Particularly for S&T topics, some resources will necessarily be long and take time to complete; many will not be customized for a given member or committee. The ITIF, often cited as a good model for S&T information, also has long, deeply-researched reports on topics like the future of work and rapid decarbonization—topics that are not well-suited to short policy memos.

192 Anonymous Congressional Staff Member.

193 Anonymous Congressional Staff Member.

194 Anonymous Congressional Staff Member.

195 Anonymous Congressional Staff Member.

196 Anonymous S&T Resource Provider, Interview with Anonymous S&T Resource Provider.

197 Anonymous Congressional Staff Member.

198 Anonymous Congressional Staff Member.

199 For an example brief, see <https://itif.org/publications/2019/07/03/two-tools-two-jobs-difference-between-carbon-taxes-and-energy-technology>

Additionally, some resources are trainings or small roundtables; they are not short memos, are difficult to put together on short notice, and are not necessarily concise. They are, however, recognized as extremely valuable. As noted earlier, Washington D.C.-based trainings by the Wilson Center and Georgetown’s Institute for Technology Law & Policy are lauded for offering useful discussions and trainings on emerging S&T issues.<sup>200,201</sup> Current and former staffers noted that private, off-the-record roundtables allow members to ask “stupid questions” to experts, bolstering their knowledge without risking their standing.<sup>202,203</sup>

Rather than a firm recommendation then, the characteristics above should help guide external providers in their interactions with Congress. Sometimes the characteristics are warranted; other times, not. The overarching emphasis should be, as one producer of S&T resources put it, in simply answering the question, “How do [we] market science advice” to Congress?”<sup>204</sup>

Here, universities and foundations can play a role; they should help providers of S&T information to craft compelling policy advice by offering trainings and other resources.

\* \* \*

Closing any gap alone will not ‘fix’ Congress’s S&T capacity issues. Investing in increasing staff while maintaining the 20<sup>th</sup>-century model of hiring mostly generalists would continue to make it difficult for members to legislate and conduct oversight on complicated S&T topics. Failing to raise awareness and build pathways for S&T talent to work on Capitol Hill by starting young and offering training to mid-career S&T experts would reduce the effectiveness of the hired staff. But acting to bridge the divide between what Congress can absorb and the information it is given through **multiple actions** will help it craft legislation and conduct oversight on emerging S&T issues.

200 “Science and Technology Innovation Program.”

201 “Institute for Technology Law & Policy @ Georgetown Law.”

202 Anonymous Congressional Staff Member.

203 Anonymous Congressional Staff Member.

204 Anonymous S&T Resource Provider, Interview with Anonymous S&T Resource Provider.





# WIRED

## Why Big Tech and the Government Need to Work Together

by Ash Carter

The arc of innovation has reached an inflection point, and the risks of unchecked growth are becoming increasingly apparent. The pace of technological change is accelerating, and the potential for disruption is immense. We must find ways to harness this power for the benefit of all, rather than allowing it to be controlled by a few powerful interests. This requires a new approach, one that brings together the strengths of both the private sector and the government. We need to create a framework that encourages innovation while also ensuring that the public interest is protected. This is a challenge, but it is one that we must meet if we are to realize the full potential of the digital age.

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## 5. Conclusion

*“We will never regain our status as a coequal branch of government until we start treating ourselves as a coequal branch. And that requires big ideas and big investments.”<sup>205</sup>*

*—Representative Katherine Clark*

The United States of America has changed drastically since its founding, and Congress has changed with it.

In the first half of the 20<sup>th</sup> century, congressional leaders added staff and nonpartisan expertise in a recognition that the pace of change was outstripping their ability to reckon with it. In the second half of the 20<sup>th</sup> century, a new generation of congressional leaders created nonpartisan centers of fact and analysis to, in part, serve as a bulwark against the increasing power of the executive branch.

Today, congressional leaders should once again take stock of Congress’s S&T capacity.

They should recognize that in many ways, Congress is falling behind—that it is less capable of responding to scientific advancements and technological innovations than it should be. In the years ahead, Congress will need to confront issues like climate change, artificial intelligence, and synthetic biology—to say nothing of the technologies yet to be invented or the scientific advancements yet to be discovered.

They should understand that Congress’s current limitations is, partly, a result of its own decisions—the clear and unsurprising consequence of hollowing out committee and support agency staff while not giving members the resources they need to do their jobs.

And they should remember that they have the power to do something about it. Creating a new S&T-focused support agency, reinvesting in

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<sup>205</sup> Clark, Katherine, Testimony Before the Select Committee for the Modernization of Congress.

congressional personal offices, committees, and support agencies would give Congress the space to be more proactive about S&T issues. Hiring a greater proportion of staffers with technical talent and utilizing external resources that balance a diversity of perspectives and options

would give Congress the in-house expertise to craft quality legislation and conduct meaningful oversight.

It is not only Congress's responsibility to improve its S&T capacity; universities, think tanks, non-profits, and S&T experts have important roles to play, too. Academic institutions need to help Congress raise awareness and update its hiring pathways. This can be done by encouraging undergraduates to pursue S&T degrees to apply their knowledge to the policymaking process, and by actively working with Congress to ensure that students have a positive experience. Additionally, think tanks, policy institutes, and non-profits need to help prepare mid-career S&T experts interested in working on Capitol Hill by training them on how to be effective policy advisors in Congress—a very different working environment than a research laboratory or a private company.

Shoring up Congress's internal capabilities will go a long way towards improving its S&T capacity, but providers of S&T information must also do the work of learning how to take their research and expertise and distill it into something that Congress can efficiently use. Organizations like universities, think tanks, and foundations need to also invest in trainings and programs designed to teach experts how to inform, and work with, Congress.

Some will argue that spending more on Congress is a waste of taxpayer funding—that existing internal and external resources are enough for Congress to do its job. They will say that Congress is a body built for generalists to work in, not for those with specific technical expertise. Furthermore, they will say that existing bodies can and are doing the type of long-term thinking on scientific advancements and technological innovations, and therefore nothing new is needed.

And yet: few argue that Congress is its job to appropriately address emerging S&T issues. What exists now is not sufficient; something new is needed.

Updating Congress for the 21<sup>st</sup> century will not be easy. It will require members to take unpopular votes on increasing Congress's funding, and to make the case to their constituents that the least popular and least trusted branch of government should be stronger. It will require members and their staff to build new pathways into the organization, to bring in talent that was previously excluded from consideration. It will demand bipartisan cooperation in an age of polarization, to give a new support agency the space it needs to honestly reckon with S&T issues—even, and especially, when the answers it provides are not politically convenient.

But forming a more perfect union has never been easy. It has always demanded courage and conviction, passion and perseverance. It has taken effort to build something new, updating old bodies for new circumstances. As the branch of the federal government closest to the people, it is up to Congress to do the work of establishing a more perfect union. It is time to get to work.



# Appendix: Understanding the Root Causes of a Lack of Congressional S&T Capacity

This report focuses on how Congress informs itself on S&T issues, but it is not possible to completely isolate this issue from the broader, structural problems that Congress faces. Structural challenges affect how Congress receives, absorbs, and uses S&T resources.

## Root Causes of a Lack of Congressional S&T Capacity

A root cause analysis shows that much of what ails Congress can be traced back to two interrelated issues: insufficient funding and structural impediments.

### 1. Insufficient Funding

As noted earlier, Congress does not give itself the human capital and funding necessary to be an effective co-equal branch of the federal government. Worse still: it has taken away resources from itself even as its job gets more difficult.

In short, members of Congress are not allocated the resources to hire experienced, expert personal staff; committee staff has been significantly reduced; support agency staff has been slashed or, in some cases, eliminated altogether.

### 2. Structural Impediments.

Partisan redistricting and the self-sorting of Americans into politically-homogenous zones have created effective one-party control in many congressional districts, while rising negative partisanship drives Americans to vote *against* one party, not for the other. Combined with the nationalization of political issues, these forces drive strong electoral incentives to prevent progress on any piece of legislation that gives a “win” to the other party. Political gridlock, and

the inability to act on issues of national or international import, follow from these structural issues.

Political scientists and scholars of Congress created a measure known as DW-NOMINATE, which analyzes the voting records of members of Congress to identify how liberal or conservative they are; the scores can then be aggregated at the party level.<sup>206</sup> Over time, the aggregate DW-NOMINATE scores of Republicans and Democrats have diverged widely:

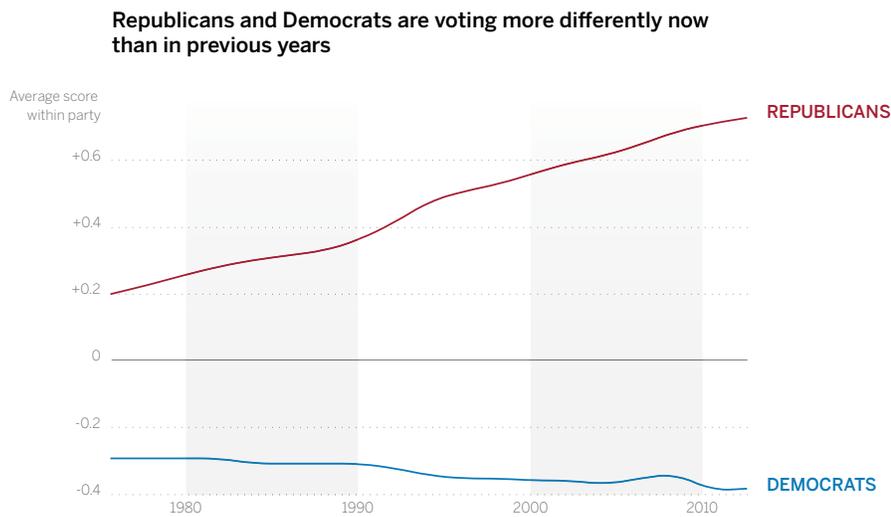


Figure 10. DW-NOMINATE Scores  
Source: VoteView Project

In other words, Republicans and Democrats vote very differently, and they vote more differently now than in previous years.<sup>207</sup>

There are many potential reasons for this, some of which are briefly described later in the section. Party polarization is a concern because “the American political system typically requires bipartisan coalitions in order

<sup>206</sup> The VoteView Project, which was founded by Keith Poole and Howard Rosenthal, the creators of the DW-NOMINATE measure, explains further: “Ideological positions are calculated using the DW-NOMINATE (Dynamic Weighted NOMINAL Three-step Estimation). This procedure was developed by Poole and Rosenthal in the 1980s and is a “scaling procedure”, representing legislators on a spatial map. In this sense, a spatial map is much like a road map—the closeness of two legislators on the map shows how similar their voting records are. Using this measure of distance, DW-NOMINATE is able to recover the “dimensions” that inform congressional voting behavior. The primary dimension through most of American history has been “liberal” vs. “conservative” (also referred to as “left” vs. “right”). A second dimension picks up differences within the major political parties over slavery, currency, nativism, civil rights, and lifestyle issues during periods of American history.”

<sup>207</sup> Moskowitz, Rogowski, and Snyder, “Parsing Party Polarization in Congress,” 3.

to get big things done, but during periods of intense political polarization, it is almost impossible for those coalitions to form.”<sup>208,209</sup>

\* \* \*

Both root causes are weighty and difficult to change. While broader structural reform is likely necessary to catalyze lasting change, it is still useful to consider the specific S&T issues Congress faces and to offer means of addressing them.

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208 Klein, “Congressional Dysfunction.”

209 Some scholars dispute the value of analyzing DW-NOMINATE scores, arguing that the underlying methodology exaggerates ideological differences between the parties. Instead, they argue that party leadership has become more effective at controlling the Congressional vote calendar. For more, see: Wallach and Wallner: <https://www.rstreet.org/2018/06/15/congress-is-broken-but-dont-blame-polarization/>

# How Insufficient Funding and Structural Impediments Affect Congress's S&T Capacity

Understanding the root causes of a lack of congressional S&T capacity

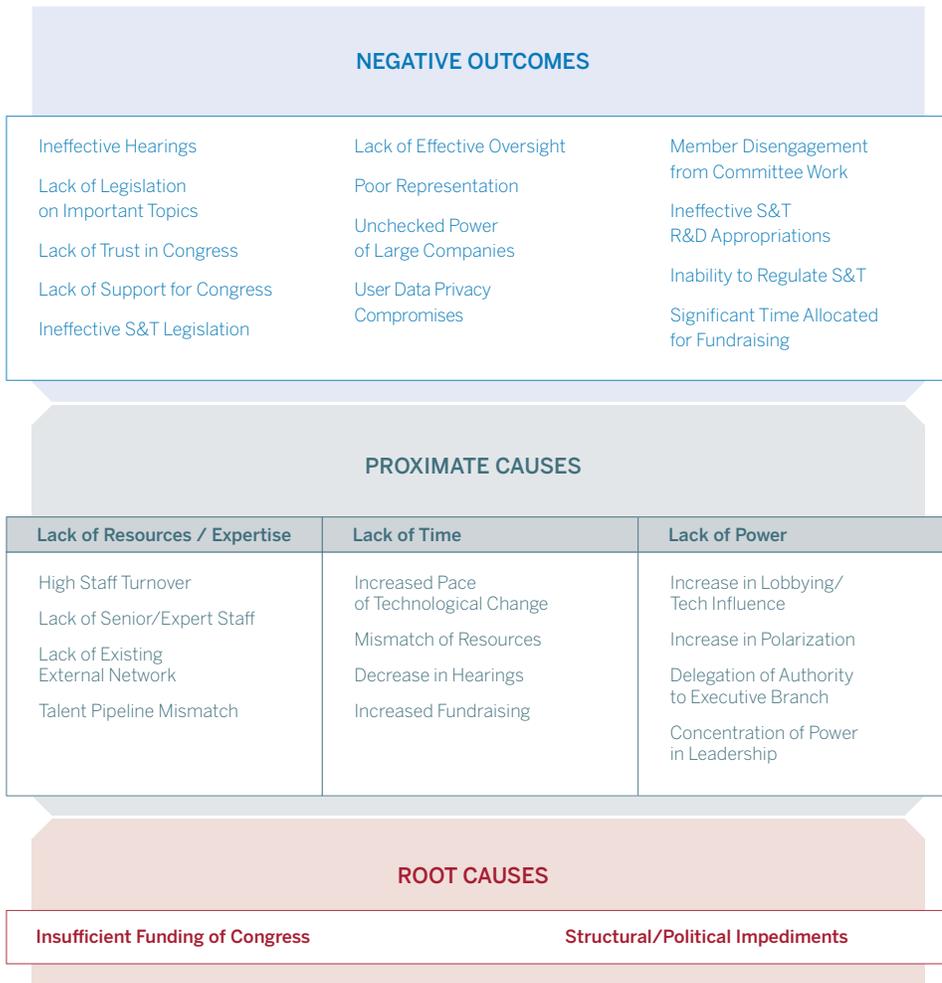


Figure 11. Root cause analysis.  
Source: Interviews, Author Analysis

Insufficient funding and broad structural impediments result in several issues that affect Congress's S&T capacity, including:

## 1. **A Lack of Resources, Which Contributes to High Staff Turnover and Less In-House Expertise**

*“An institution that cannot help its employees develop the knowledge, skills and abilities they need to perform their duties—or compensate and retain them once they do—becomes significantly less effective than it has the potential to be.”<sup>210</sup>*

–State of the Congress, 2017

### **High Staff Turnover**

One proxy of employee satisfaction is how long individuals stay with the organization. As a 2017 report on Congress notes, “Staff turnover on Capitol Hill is continuous” and “there are no staff positions in Senate or House committees or personal offices with a median tenure of more than four years.”<sup>211</sup> While turnover is normal in any organization, Congress’s high turnover out of the institution indicates issues with employee satisfaction.

In a 2013 report on congressional staff satisfaction, the most cited reason for leaving Congress altogether was compensation: “45% of congressional staff also said increasing their income was a significant factor in their decision to leave Congress altogether.”<sup>212</sup> Work-life balance, disillusionment, and other opportunities were other important reasons cited.

Turnover is harmful to the institution and stressful for the staff who stay:

*“The loss of institutional memory, policy expertise, and process knowledge all take a toll. There is also significant time and expense associated with continuously hiring and training new employees.*

210 Goldschmidt, “State of the Congress: Staff Perspectives on Institutional Capacity in the House and Senate.”

211 Goldschmidt, 12.

212 Congressional Management Foundation and Society for Human Resources Management, “Life in Congress: Job Satisfaction and Engagement of House and Senate Staff,” 7.

Turnover also leads to lack of productivity and disruption to teams and workflows.”<sup>213</sup>

High employee turnover—and the dissatisfaction it indicates—affects congressional S&T capacity by making it more difficult to recruit and retain staffers with S&T expertise, many of whom could take higher-paying jobs in the executive branch or in the private sector.

### **Lack of Senior/Expert Staff**

In a 2016 survey of senior congressional staff, only 15% were very satisfied with their chamber’s staff knowledge, skills, and abilities.<sup>214</sup>

An analysis of staff age of the current House of Representatives shows that approximately 55% of House staff is under 30 years old; about 52% of Senate staff is under 30.<sup>215</sup>

**A majority of House of Representatives staffers are under 30 years old**

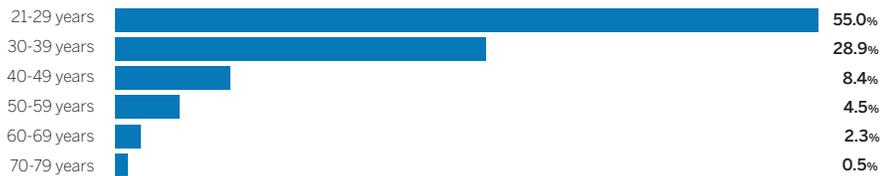


Figure 12. House of Representatives staff by age.  
Source: Legistorm

While there are many hard-working, smart, and thoughtful young people working in congressional personal offices and on committees, they nonetheless lack experience and expertise that would be valuable to have in the office.

213 Goldschmidt, “State of the Congress: Staff Perspectives on Institutional Capacity in the House and Senate,” 12.

214 Goldschmidt, 10.

215 Legistorm, “The 116th Congress By the Numbers.”

## 2. **A Lack of Time—Driven by Increased Responsibilities and Additional Time Spent Fundraising—Which Contributes to a Decrease in Congressional Hearings**

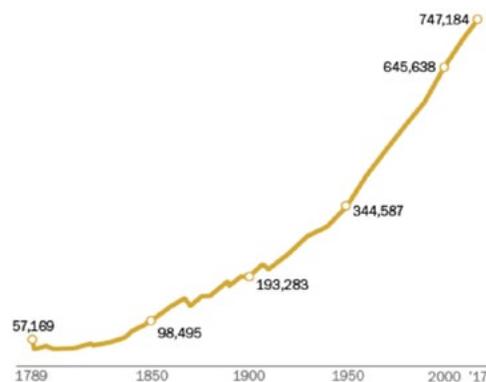
Members of Congress are being asked to do more with less. Even as the number of constituents they represent increases, they are forced to spend more time fundraising, which leaves less time for committee work and other legislative responsibilities.

### ***Increase in Constituent Responsibilities***

In 2017, the average U.S. House Representative represented 747,000 constituents—an all-time high.<sup>216</sup>

#### **The number of people per representative has grown dramatically since nation's founding**

*Number of people represented by one U.S. House member*



Note: States admitted in close time proximity to each other are analyzed together. Although a slave was considered three-fifths of a person for apportionment until 1868, figures above are based on an equal count of total population in all represented states.  
Source: Decennial census (for years in which census-based reapportionment took effect, typically third year after each census); Census Bureau intercensal population estimates (for 1907 and 1959); Pew Research Center estimates (all other years).

PEW RESEARCH CENTER

While the MRA “FY2019 funding level is approximately equivalent to the funding level provided when the account was established in FY1996, when adjusted for inflation,” between 2000 and 2017 the average number of people represented per House member has risen by 15.7%.<sup>217,218</sup>

216 Desilver, “US Population Is Growing, but House of Representatives Is Stuck at 435.”

217 Brudnick, “Members’ Representational Allowance: History and Usage,” 6.

218 Desilver, “US Population Is Growing, but House of Representatives Is Stuck at 435.”

To keep up with constituent services requests while staff levels stay constant, members must shift their staff to district offices. From 1979 to 2016, House personal staffs in district offices increased from 34.6% to 47.3%, leaving fewer policy-focused staff in Washington, DC.<sup>219</sup> This has a direct effect on an office's overall policy capacity: more constituents require more constituent services staff, which leads to fewer policy staff. For policy areas where an office is already weak, like S&T issues, the capacity constraints are even more pressing.

### ***Increased Time Spent Fundraising***

In 2013, a leaked presentation to incoming members of Congress recommended spending at least four hours per work day in Washington, D.C. fundraising for their next campaign.<sup>220</sup> While this was just suggested, and actual fundraising time is not known, many members note that it is not an unreasonable estimate for what they are expected to do; they also note that the amount of fundraising has increased over time, replacing time they would have spent handling constituent needs, doing committee work, and educating themselves on policy issues.<sup>221,222</sup>

In other words, more time spent fundraising means less time doing everything else—including taking the time to learn about and understand emerging S&T issues.

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219 "Vital Statistics on Congress."

220 Klein, "The Most Depressing Graphic for Members of Congress."

221 Grim and Siddiqui, "Call Time For Congress Shows How Fundraising Dominates Bleak Work Life."

222 Klein, "The Most Depressing Graphic for Members of Congress."

## Decrease in Hearings

Over the past 40 years, the number of congressional committee and subcommittee meetings has decreased drastically:<sup>223</sup>

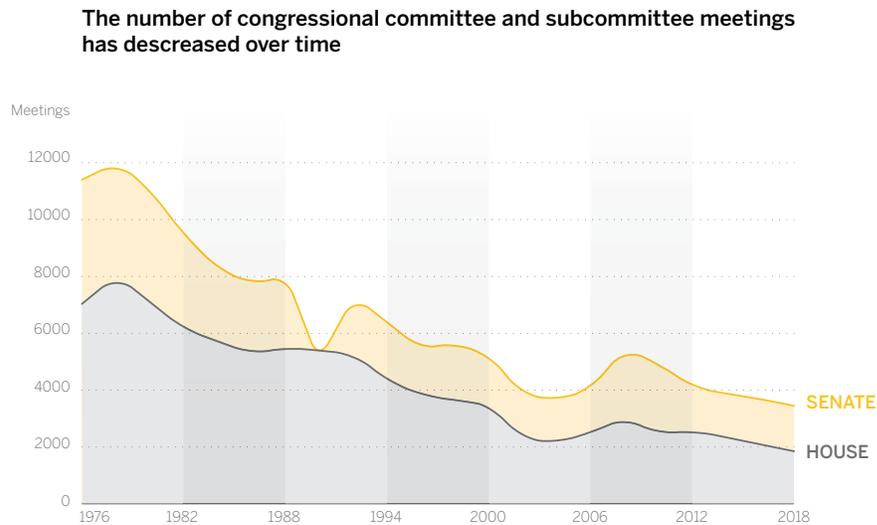


Figure 13. Committee and subcommittee meetings by year.  
Source: Brookings Institution

This decline has made it much more difficult for members of Congress to properly conduct oversight of the executive and judicial branches. Hearings are also an important information-gathering activity through which committees and subcommittees are empowered to compel expert witness testimony on issues at hand. Fewer hearings means fewer opportunities to learn about emerging S&T issues from experts and less need to prepare for hearings. Taken together, this reduces congressional S&T capacity.

<sup>223</sup> "Vital Statistics on Congress."

### 3. **A Lack of Committee Authority, as Congress’s Power Has Been Ceded to the Executive Branch, Taken by Congressional Leadership, and Diffused Through Various Committees**

Congress has given up power to the executive branch, ceding responsibility for foreign policy and some domestic concerns. Additionally, congressional leadership has taken power away from committees over the past 25 years, atrophying the traditional policymaking process.

#### ***Delegation of Authority to Executive Branch***

In previous decades, the balance of power between the executive branch and the legislative branch has tilted decidedly towards the former branch. On issues as diverse as trade, foreign policy, and even budgetary priorities, a bipartisan chorus of political scientists, former elected officials, and political commentators argue that Congress has allowed the president to wield too much power that was originally Congress’s. Senator Ben Sasse put it succinctly: “For the past century, more legislative authority has been delegated to the executive branch every year.”<sup>224</sup>

The branches of the federal government were designed to check one another; as James Madison or Alexander Hamilton famously argued in the 51<sup>st</sup> Federalist paper, “ambition must be made to counteract ambition.”<sup>225,226</sup> When the legislative branch cedes authority to the executive branch, it is less able to complete one of its vital responsibilities: conducting oversight on the executive branch.

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224 Sasse, “Opinion | Blame Congress for Politicizing the Court.”

225 Hamilton and Madison, “The Avalon Project.”

226 Most scholars believe that James Madison wrote Federalist 51 and treat it as one of his contributions to the project.

## ***Concentration of Power in Leadership***

In recent years, legislation has increasingly been written in House and Senate leadership offices, rather than through the relevant committees:

“Prior to the 1970s, almost all legislation considered on the House and Senate floors was reported out of committee. Since the 1990s, the percentage of bills that skip committees altogether has risen steadily. In the 113th Congress (2013-2014), more than half of the major legislation that came to the floor of the Senate and about 40% in the House bypassed committees.”<sup>227</sup>

As an anonymous member of Congress wrote in 2015, this reduces the incentives for members to be active in committee work, with negative consequences for both individual members of Congress and for the body as a whole:

“The result is members routinely don’t show up at committee hearings, or if they do show up, it’s only to ask a few questions and leave. A lot of members fight for committees that will help them raise money or get a sweet lobbying job later (more on that in a minute). The result is that the engine for informed lawmaking is broken.”<sup>228</sup>

In concentrating power in congressional leadership, Congress reduces its S&T capacity by allowing committee expertise to atrophy. As a result, some of the collaborative nature of policymaking is degraded and legislation has less of an opportunity to be molded by the inputs of various stakeholders. Additionally, the opposition party may feel like it was not given a sufficient role to play in crafting or commenting on the legislation, potentially reducing its incentive to attempt to work together to hash out a compromise.

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227 Goldschmidt, “State of the Congress: Staff Perspectives on Institutional Capacity in the House and Senate,” 14–15.

228 A Member of Congress, “Confessions of a Congressman: 9 Secrets from the Inside.”

## ***Issues with Jurisdiction***

Structurally, there is not one committee in Congress that has sole jurisdiction over S&T policy issues. As one CRS report put it, “Almost every congressional committee is in some way involved in S&T policy decision making or uses the scientific and technical knowledge currently available to help them make decisions.”<sup>229</sup> Across both the Senate and the House of Representatives, nearly every committee has a portfolio that touches on S&T issues, including Commerce, Science, and Transportation in the Senate and Science, Space, and Technology in the House. Additionally, there are several dozen caucuses and a handful of staff working groups with issue areas that fall under the broad umbrella of science and technology.<sup>230</sup>

It is somewhat inevitable that S&T issues will be suffused into multiple committees—such is the nature of S&T knowledge. One issue with this is that there are not always clear jurisdictional lines as to what committee ‘owns’ a given issue, which leads to infighting and a reluctance to collaborate. This potentially leads to S&T resources not being shared among siloed, competing committees, even when multiple committees are working on the same S&T issue.

As a result of this decentralized, overlapping, and at times competing system, it has proven difficult to centralize expertise in any given S&T topic area, which reduces S&T capacity in Congress as a whole.

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229 Stine, “Science and Technology Policymaking: A Primer,” 15.

230 For a list of the 116<sup>th</sup> Congress’s caucuses, see [https://cha.house.gov/sites/democrats.cha.house.gov/files/documents/cmo\\_cso\\_docs/116th%20CMOs\\_07-18-2019.pdf](https://cha.house.gov/sites/democrats.cha.house.gov/files/documents/cmo_cso_docs/116th%20CMOs_07-18-2019.pdf)





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