

Harvard GSAS Science Policy Group

2017 Trip to Washington, D.C.
Visit Report

Written by all trip participants

Edited by Madeleine Jennewein,
Cory Gerlach, and Michelle Frank

Table of Contents

Introduction	3
Trip Participants	5
Organizations visited during Harvard GSAS Science Policy DC Trip	6
Science Policy Fellowships	7
The National Aeronautics and Space Administration (NASA)	8
House Committee on Science, Space, and Technology–Subcommittee on Research and Technology	10
Jeffrey Mervis–Reporter at <i>Science</i> magazine	14
Department of Homeland Security–Office of Strategy, Planning, Analysis, and Risk	16
The National Academies of Science, Engineering and Medicine (NASEM)	21
Strategic Marketing Innovations (SMI)	23
The National Institutes of Health (NIH)	25
Pew Charitable Trusts	26
The White House Office of Science Technology and Policy (OSTP)	27
Department of Education	29
Harvard Office of Federal Relations	31
Department of Health and Human Services—Assistant Secretary for Preparedness and Response (ASPR) / Biomedical Advanced Research and Development Agency (BARDA)	32
Government Accountability Office (GAO)	34

Introduction

Over three days in April 2017, fifteen Harvard students in the Graduate School of Arts in Sciences visited Washington, D.C., to visit several federal agencies and learn about the diversity of career opportunities in science policy. Along the way, they met with agencies across the government, executive branch agencies, legislative branch offices, nonprofits and lobbying firms. The trip was highly successful in showcasing the different ways that science contributes to policymaking within the federal government, as well as the many routes for PhD-level scientists to enter into policy careers.

The students on the trip were selected from a competitive applicant pool to represent a variety of academic fields, including the biomedical sciences, environmental sciences, and engineering. They also came from many different stages in their PhD research, and brought with them a diverse set of interests in science policy and long-term career plans following graduate school.

The student-run Harvard GSAS Science Policy Group organized all of the trip visits, selected student applicants, secured funding, and led the trip in Washington, D.C.



Acknowledgements

The group would like to thank the following sources of funding who made this trip possible:

1. The Division of Medical Sciences at Harvard Medical School
2. The Graduate School of Arts and Sciences at Harvard University
3. The Graduate Student Council at Harvard University
4. Harvard University Center for the Environment
5. Harvard Program in Therapeutic Science
6. Biological Sciences in Public Health PhD Program at the Harvard T.H. Chan School of Public Health

We also like to thank all of the federal agencies and organizations for allowing us to visit. We are particularly grateful for the Harvard Alumni and other policy makers who generously shared their time and energy with us.

Huge thanks to Jane Riccardi from the Division of Medical Sciences for assisting in so many aspects of the trip planning, including organizing transportation, accommodations, and the Harvard Alumni Happy Hour.

Trip Participants:

Felix Barber (G3, MCB)
Garrett Dunlap (G1, BBS/Therapeutics)
Olivia Foster (G2, BBS/Systems Biology)
Michelle Frank (G4, Neuroscience)*
Cory Gerlach (G3, BPH/Therapeutics)*
Madeleine Jennewein (G3, Virology)
Joannes Maasackers (G4, Env Science & Engineering)
Clara Meaders (G5, OEB)
Caitlin Nichols (G4, Genetics/BBS)
Jamaji Nwanji-Enwerem (G5, MD at HMS/PhD in BPH)
Katherine Richeson (G5, Cell Biology/BBS)
Jessica Sagers (G3, SHBT/Therapeutics)
Jacob Shenker (G1, Systems Biology)
Rachel Silvern (G3 EPS)
Terrence Wong (G6, BBS)
Heather Law (Harvard OCS)

*Trip organizers



Organizations visited during the trip

- **Executive Branch**

- White House Office of Science and Technology Policy (OSTP)
- Department of State, Science & Technology Adviser to the Secretary (STAS)
- Department of Homeland Security (DHS), Strategy, Plans, Analysis & Risk (SPAR)
- Department of Health and Human Services (HHS), National Institutes of Health (NIH), Office of the NIH Director
- Department of Health and Human Services (HHS), Office of the Assistant Secretary for Preparedness and Response (ASPR), Biomedical Advanced Research & Development Authority (BARDA)
- Department of Education, Office of Education Innovation Programs, Office of Improvement and Innovation
- National Aeronautics and Space Administration (NASA)

- **Legislative Branch**

- House Committee on Science, Space, & Technology – Minority Leadership (Democrats)
- U.S. Government Accountability Office (GAO), Applied Research and Methods, Center for Science, Technology, and Engineering

- **Non-Profit, Non-Governmental Organizations (NGOs)**

- National Academies of Science, Engineering, and Medicine (NASEM), Policy and Global Affairs Division, Committee on Science, Technology and Law
- Pew Charitable Trusts

- **Private Organizations**

- *Science* (journal)
- Strategic Marketing Innovations (SMI)
- Harvard University Office of Federal Relations



Resources – Science Policy Fellowships

- AAAS Science & Technology Policy Fellowship
- Presidential Management Fellows (PMF)
- Science and Technology Policy Institute Fellowship (STPI)
- Christine Mirzayan Science and Technology Policy Graduate Fellowship Program (NASEM)
- White House Office of Science and Technology Policy (OSTP) Internship Program
- Professional Societies
 - American Society for Biochemistry and Molecular Biology (ASBMB) Science Policy Fellowship
 - American Society for Microbiology (ASM) Congressional Science Fellowship
 - American Society of Hematology (ASH) Congressional Fellowship
 - American Society of Human Genetics (ASHG) Genetics & Public Policy Fellowship
 - Society for Neuroscience (SfN) Early Career Policy Ambassadors Program
 - American Chemical Society (ACS) Congressional Fellowship
 - American Physical Society (APS) Congressional Science Fellowship
- California Council on Science and Technology (CCST) Science & Technology Policy Fellows



The National Aeronautics and Space Administration (NASA)

Author: Joannes Maasakkers

Date: April 5th, 2017

Meeting With:

Tom Cremins, Associate Administrator for Strategy and Plans

Thomas Zurbuchen, Associate Administrator for the Science Mission Directorate

Overview

The National Aeronautics & Space Administration (NASA) focuses on several topics including aeronautics, security, science (subdivided into planetary, helio, astrophysics and earth applications), human exploration (International Space Station (ISS)), and space technology (interfacing with private space industry). This large range of topics requires expertise on many different fronts. At NASA, we met with the Associate Administrator for Strategy and Plans, Tom Cremins, and the Associate Administrator for the Science Mission Directorate, Thomas Zurbuchen. Tom Cremins previously worked on national security issues and is motivated by an interest in how policy shapes science and how science shapes policy.

The enduring purpose of NASA boils down to discovery, exploration, and development. These purposes connect with three different themes:

- *Fostering discovery and exploring the unknown:* an example of this is the Cassini mission to Saturn, the first spacecraft to enter Saturn's orbit. Missions like this incite great public interest. Another example is the mission to Europa that is currently in progress, with the goal to send an orbiter in 2022.
- *Global engagement and diplomacy:* NASA works with over 160 nations around the world and over 80% of its missions are international collaborations. This includes the long-term ISS and contracts with emerging space nations like South Korea.
- *Security and industrial base:* As more countries enter into space, increased interaction and policy agreements between nations is required. Space opportunities for different countries can be used as part of international negotiations.

Current roles of NASA

NASA is a leader in innovation and discovery both domestically and internationally. Unlike many other federal agencies, NASA strives to create a unified message that it is a space agency for the entire world, not only the United States—after all, many of their discovery missions serve as an inspiration to all of humanity, not only Americans. Although the NASA headquarters is still in transition, this role resonates with the new administration.

NASA is also involved in numerous public-private partnerships. They consult for and work with private corporations like Space X and Blue Origin that are trying to generate technologies for private space flights and space tourism. Although that possibility is enticing, we are still likely many years away from a viable space tourism industry. The International Space Station and other NASA endeavors have also created a market for private commercial enterprises: private contractors send unmanned missions to the ISS to deliver supplies, as well as working with NASA to coordinate launches and build technologies.

When it comes to climate change, there is a strong understanding that atmospheric changes lead to security challenges, especially from countries under duress from environmental challenges. It is important to communicate these challenges in the most fitting way, in part by using rhetoric that may be less politically charged than “climate change.”

Future challenges include developing a successor for the ISS as it nears the end of its lifespan around 2028. NASA is also investigating new ways of modeling space debris and of decreasing the amount of new debris that enters orbit. (Space debris is created when objects in space collide or when old, outdated equipment is scrapped. It poses a serious hazard to spaceships and satellites.)

Careers at NASA

NASA has been chosen as best place to work in the government for the past five years and has employees with diverse backgrounds. There are many ways of entering the government, including fellowships through AAAS, the Science, Technology, and Policy Institute (STPI), and the presidential management fellowships. There are also opportunities through research fellowships at the different NASA centers. A lot of PhDs are active on the policy side, as well. It is important to remain flexible throughout your career, as unexpected opportunities may arise. NASA also recruits scientists from academia—including academic faculty—to fill policy roles.

House Committee on Science, Space, and Technology – Subcommittee on Research and Technology

Authors: Rachel Silvern and Caitlin Nichols

Date: April 5th, 2017

Meeting with:

Dahlia Sohklov, Minority Staff Director, Subcommittee on Research & Technology, House Committee on Science, Space, & Technology

Overview

The House Committee on Science, Space, and Technology authorizes federal, non-defense activities related to science, technology, engineering, and mathematics (STEM). The committee has full jurisdiction over agencies including NASA, the White House Office of Science and Technology Policy (OSTP), the National Science Foundation (NSF), and the National Institute of Standards and Technology (NIST). The Committee also has partial jurisdiction over other agencies, including the National Oceanic and Atmospheric Administration (NOAA), the Environmental Protection Agency (EPA), and the Federal Aviation Administration (FAA), as well as over research and development activities at the Departments of Commerce, Energy, Homeland Security, and Transportation.

Committee organization and makeup

The Committee is composed of the following five subcommittees: energy, environment, research and technology, space, and oversight. Four—all except oversight—are authorization committees. The research and technology subcommittee has jurisdiction over policies and programs related to research and development, STEM education, and international scientific cooperation.

The chair of the committee—currently Rep. Lamar S. Smith (TX-21)—determines the ratio of majority to minority legislators on each subcommittee; this ratio is currently 2:1, which also determines the ratio of staff. The minority has 16-17 staff members including a Chief of Staff, Chief Council, and Communications Director for the full committee, as well as policy staff assigned to each of the five subcommittees. The majority calls and sets the agenda for committee hearings and is responsible for calling three witnesses, while the minority can select one witness.

Members of Congress submit their committee preferences at the beginning of each term, and assignments are typically given based on seniority, with more senior legislators receiving plumb assignments. This committee is not considered to be a coveted assignment, although some members do request it based on previous professional experiences, the presence of a research center in their district, or pure curiosity. However, many freshmen members assigned to this committee will rotate off to more prestigious committees in later terms.

Enacting legislation through the committee

Every bill originates “in committee,” beginning with its corresponding subcommittee. Amendments can be added in subcommittee or full committee, and can be handled in one of three ways: they can be added without a vote, voted on with a yay/nay vote, or voted on with a roll call vote. Generally, members of the majority caucus won’t split with the chair on voting matters, but if they do, they will give the chair notice so he or she can make sure the item can pass while keeping individual legislators’ constituents happy. This politicking is part of what’s known as “the whipping process.” The Chair, Ranking Minority Member, and sitting Members vote on legislation in subcommittee, and if it passes, it is “reported out of subcommittee as amended.”

Amendments can be added in full committee as well, but they must be submitted at least 24 hours in advance (amendments may also be submitted during committee meeting, but the Chair can decide not to consider them). The current majority has set a “3-day rule” for proposed legislation—that is, the text of the bill and proposed amendments must be available for review three business days prior to consideration in committee. Before debate can commence, the Majority must file a report explaining the legislation (background, Committee interpretation, etc.); the Minority may also contribute its interpretation of the legislation to the report. Additionally, this report may set rules for debating the legislation, such as the number and identity of amendments it will consider. Majority and Minority staff members may communicate with each other prior to the start of debate so each side knows what is coming during the “mark-up” in full Committee. The Committee then debates the bill and votes whether to table (reject) the measure or report it to the full House, which then debates and votes on the legislation, as well.

For a bill to become law, it must be passed by both the Senate and the House. If both bodies have similar bills, staffers may meet in private to negotiate an agreement. Alternatively, legislation may “ping-pong” between bodies as it is amended and passed between the House and the Senate. An additional option for reaching an agreement involves calling a formal conference of members from both bodies to hash out remaining differences in public. Occasionally, the Senate will bypass these normal procedures and force the House to agree with its legislation or walk. For instance, in the case of the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act of 2007 (or America COMPETES Act), the legislative session was about to end, and the Senate “hotlined” its bill (passed it without debate by a unanimous vote). Because there was little time for the House to respond, Senate staffers instructed House staffers to pick the three most important items in the House bill for inclusion and passage of the Senate bill, forcing the House to “take or leave” the bill essentially as it was.

Working as committee staff

Dr. Sokolov received a BS in Engineering Physics from the University of California at Berkeley and a Ph.D. in Bioengineering from the University of Washington. She completed a postdoctoral fellowship at the National Institutes of Health before joining the Committee as an American Institute of Physics Congressional fellow.

On the Democratic side, staffers generally have a science background and try to follow the evidence, but their jobs are inherently political. The role of the staffers on the sub-committees is to advise the committee members on policy. In practice, this means the staffers develop as much expertise as possible, cultivate a network of experts in the stakeholder community, and distill this information into recommendations for the Democratic committee members. Minority staff advise on hearings set by the majority, including by helping vet and select the minority witnesses. Minority staff also prepare legislators for hearings by providing questions, opening statements, background information on witnesses, and potential talking points from the other side of the aisle. Day-to-day work as a staffer includes preparing for hearings, phone interviewing potential witnesses, drafting and vetting legislation, developing amendments to legislation, and developing communications strategies in concert with the communications team.

Dr. Sokolov described how she and other staffers balance following the science while doing an inherently political job. For instance, the Minority staff has stopped including in their talking points for legislators the frequently cited statistic that 50% of economic growth since 1950 can be tied to research and development—because the basis for this claim is shaky. However, sometimes staffers will write points that may not be 100% proven but that they believe to be true and congressional representatives may still cite shaky statistics even against the urgings of their staffers. In either case, Dr. Sokolov has never been forced to defend something she believes is totally false.

Dr. Sokolov described how staff has been harmed over the last several years, as there has been a lot of turnover. The committee itself has become increasingly partisan and made up more of ideologues than public servants. In the past, legislators spent more time in DC and so had more time to get to know representative across the aisle, allowing for better relationships. In some sub-committees, there are no relationships left between staffers and members, and member relationships have particularly broken down because the congressional schedule leaves little time to socialize, members have become so ideological, and—unlike older members who have relationships with members on the other side of the aisle—younger members are not developing those relationships.

Dr. Sokolov cited the Honest and Open New EPA Science Treatment Act of 2017, or the HONEST Act, as a recent example of strategic communications work being done by the Committee. During the previous administration, President Obama would have vetoed the HONEST Act, but now that the President Trump is ideologically aligned with the majority Republican Congress, the legislation may be able to become law. Thus, minority staffers are currently strategizing on how to amplify their communications about this bill to “toxify” it or amend it in the Senate to prevent its passage there. This legislation serves as an example of the altered lawmaking dynamic under the Trump administration—while the heads of the science committees remain the same, Republican legislators may now have an easier time pushing their legislation into law.

When asked about what work she's most proud of, Dr. Sokolov mentioned two items:

1. Work on the Bush administration nuclear energy ramp-up: Legislation proposed during the Bush administration attempted to expand the use of nuclear power in the United States, including by recycling spent nuclear fuel. From her background in physics, Dr. Sokolov realized that the technology necessary to do this was not as advanced as it would need to be for the initiative to succeed. She convinced her chairperson at the time to be skeptical of the bill, which eventually led to influencing appropriations for the bill, saving millions of dollars that otherwise would have been spent to fund a premature technology.
2. Work on public access to federally funded research results: The Science, Space, and Technology Committee used its convening power to call a roundtable of stakeholders in the publishing of federally funded research, including publishing companies, universities, librarians, and scholars. This roundtable developed a series of recommendations that eventually led to a 2013 OSTP memo essentially instructing federal agencies to require public access after no longer than a 12-month embargo.

Jeffrey Mervis – Reporter at *Science* magazine

Author: Madeleine Jennewein

Date: April 5th, 2017

Meeting with:

Jeffrey Mervis, journalist, *Science*

Overview

Jeff Mervis is a senior correspondent for *Science* magazine and reports on science policy in the United States. He has reported on science policy for more than 30 years and has been working for *Science* for almost 25 years.

The role of science in policy

There's a common idea that scientists can't communicate with the public, but Jeff wanted to deconstruct that notion. The conventional wisdom is that scientists can't self-advocate or explain themselves, and therefore policy makers can't act effectively on scientists' behalf. But it's not so simple. Science literacy actually has the potential to increase the divide between viewpoints, especially in debates around vaccinations, nuclear power, GMOs etc. The idea that a lack of knowledge is what is standing in the way of progress is far over-simplified; in fact, these debates may be influenced less by a lack of understanding and more by basic disagreements about how you back up your ideas or the politics surrounding an issue. We also need to work on communicating the uncertainty of science without undermining the overall credibility of science.

Jeff also suggested that scientific lobbying should be rethought. We must be savvier about what we are asking for and how we advocate for it. To Congress, we are simply another interest group. They don't see us as the answer to everything. And in fact, science has done very well as a special interest group. NIH funding doubled between 1998 and 2003, and the NIH has always been supported by both parties.

Scientists have also had success as objective sources of policy insight. Legislators want to trust someone with objective information to be able to understand legislation, and scientists can be that source. Our goal as scientists should be to have someone there for legislators to turn to, such as scientist-policy makers and recipients the AAAS fellowship.

There are issues with how objectivity in science is discussed, because attacks on the objectivity of the scientific community have the potential to undermine the credibility of the entire scientific enterprise. Critiques of reproducibility are being used to derail certain kinds of science (specifically from Chairman Smith). *Science Magazine* also faces a risk of not being seen as objective. *Science* therefore maintains a firewall between their news arm and their role as a scientific organization/publisher: the news staff covers AAAS as they would any other scientific organization, and, they don't have access to the paper review process or the internal debate over papers.

Department of Homeland Security – Office of Strategy, Planning, Analysis, and Risk

Author: Garrett Dunlap

Date: April 5, 2017

Meeting with:

Susan Monarez, PhD, Deputy Assistant Secretary, Strategy and Analysis

Jason Ackleson, PhD, Director of Strategy, SPAR

Brian Humphries, PhD, Office of Policy

Overview

The Office of Strategy, Planning, Analysis, and Risk (SPAR) at the Department of Homeland Security plays a critical role in developing and analyzing strategies across the whole department to respond to an array of risks. For example, this division manages responses to pathogens, including monitoring emerging threats and responding accordingly to reduce the harm of outbreaks. Following a seeming lack of preparedness for the anthrax attacks of 2001, SPAR worked both within DHS and with other agencies to develop a new national biodefense strategy. As a result, nearly \$10 billion dollars are now spent per year on biodefense within the department. But SPAR does not only focus on biodefense and related issues; they are designed to analyze and coordinate policies towards any threat to the security of the nation.

Work at DHS

Since DHS is tasked with writing and carrying out the national biodefense strategy in response to epidemics and potential bioterrorism, their work spans many realms and many agencies. Their work can often be more intense and compressed than other agencies in terms of the speed with which they respond to new threats. They said one major challenge was coordinating experts and those in leadership across multiple agencies. This is particularly true in difficult, politically charged situations, where everyone wants to contribute immediately, but you need to make sure that the top tier politicians understand the science. Another challenge was the way that risk is communicated to the public; they cited the anthrax scare as an example of poorly communicated risk. For instance, they had top officials talking about smallpox vaccine stockpiling instead of anthrax. An example of the kind of work they do is a report on the threat analysis of the northern border of the United States. There, they had 180 days to research, analyze, develop stakeholders, conduct interviews, and write a report.

Opportunities and Career Advice

The staff underscored the utility of needing both technical and political backgrounds to deeply understand and influence policy. They highlighted multiple opportunities that allow someone with a PhD to step into the world of policy. Dr. Monarez, for instance, completed an American Association for the Advancement of Science (AAAS) fellowship, which she spoke highly of. Aside from these formal experiences, there are multiple skills that can be honed both during and after a PhD to prepare for a career in policy, including the ability to write concisely and in a non-technical way, and the ability to comprehend and analyze scientific literature.

Department of State – Science & Technology Adviser to the Secretary (STAS)

Authors: Terence Wong and Olivia Foster

Date: April 5th, 2017

Meeting with:

Vaughan Turekian, PhD, Science & Technology Adviser to the Secretary
Andrew Cartas, PhD, Foreign Affairs Officer (IO/STA)
Barrett Caldwell, PhD, Foreign Affairs Officer (EAP/J)
Sangeeta Rana, PhD, Science Health and Education Officer (AF/ERA)
Stephanie Aktipis, PhD, Foreign Affairs Officer (OES/ECW)
Shari Clark, PhD, Foreign Affairs Officer (CT/FO)
Ellen Connorton, PhD, Senior Science Adviser (SCA/RA)
Samuel Crowell, PhD, Agricultural Advisor (EB/TPP/AGP)
Jessica Petrillo, PhD, Senior Health Security Officer (OES/IHB)
Benjamin Schmitt, PhD, Energy Diplomacy Officer (ENR/EDP/EMA)

Overview

The U.S. Department of State's mission is to shape and sustain a peaceful, prosperous, just, and democratic world and foster conditions for stability and progress for the benefit of the American people and for people everywhere. Essentially, as Dr. Turekian said, their job is to "tell America what the world thinks and to tell the world what America thinks." The Office of the Science and Technology Adviser to the Secretary of State (STAS) was authorized by Congress in 2000. STAS works to enhance the capacity of the Department of State to respond to the evolving role of science and technology as it intersects with U.S. foreign policy interests.

Working at STAS

STAS covers technical topics that require expertise from inside and outside the State Department, especially topics that have a foreign policy implication (such as CRISPR). STAS is mission-oriented and is the face of the U.S. to the rest of the world. The staff of STAS must communicate concisely and effectively to inform and influence policy in a collaborative manner. They must be flexible outside of their area of expertise and must be levelheaded under pressure. They must not let their personal views shape policy, since STAS represents the U.S. government. Everyone contributes to the success of STAS and generally no one takes ownership of projects. There is typically a three-year attention span on high-momentum issues. STAS excels in gathering people/agencies and convening meetings, especially in international settings. To work for STAS, be open to experiences and take opportunities. Working for STAS has tremendous impact on the world.

There are 200-250 PhDs working at the State Department, working to understand the basic underpinnings of world events and particularly those that require technical expertise. They work with science as implemented in foreign policy and foreign policy as implemented through science. As Dr. Turekian said, almost all topics have science built into them. The State Dept. appreciates how a scientist addresses a problem and applies the scientific method to solve said problem.

Why did you pursue a fellowship in science policy at the State Department?

Dr. Barrett Caldwell (Jefferson Fellow): Dr. Caldwell is a Jefferson Fellow, which is for established scientists who want to be involved in policy during a sabbatical. Dr. Caldwell is interested in how humans obtain, process and use information. He is particularly interested to work in the federal government during the transition to observe flow of information when it is not in steady state.

Dr. Sangeeta Rana (AAAS fellow): Dr. Rana applied for the AAAS fellowship to try and make a broader impact and develop experience in government. She believes the lifestyle and process at the State Department is much like practicing medicine: "Whatever comes into the door needs to be addressed."

Dr. Andrew Cartas (AAAS fellow): Dr. Cartas is largely driven by an interest in national security. He has worked on a bilateral treaty with Russia to be implemented with the Department of Energy. However, after the invasion of Crimea, diplomacy stopped. He believes diplomacy is better through a scientific lens—applying critical thinking skills to relevant information.

What information did you wish you had received while at Harvard GSAS?

Dr. Ellen Connorto: Generally, if you are interested in policy, the depth of your knowledge is not that useful. Instead, being a quick, collaborative and efficient writer is the most important skill. Also, the Harvard name will not get you anywhere in the State Department. Recognize that how science is done in the US is not the same everywhere else in the world. The American "bottom-up" approach is very opaque in countries like China where research is primarily driven in a top-down manner. Working in the State Department requires you to be aware of the fact that different countries have different cultural and societal expectations. For example, the concept of women in science has a very different dynamic given the culture of the country.

Dr. Stephanie Aktipis: The State Department values good judgment over intelligence; instinct is greater than intellect. While at Harvard, students interested in policy should take the time to sit in on classes at the Kennedy School or consider the Weatherhead Center. Take time away from the lab and feel empowered to take advantage of all the opportunities available at Harvard. Keep reading from a variety of sources and take note on where your interest lies.

Applying to a AAAS fellowship at State

The AAAS application process includes essays, Skype interviews, and face-to-face interviews. Essays are not about knowledge of the field but a description of personality and interest. Demonstrate a capability to talk outside of your field and that you are flexible enough to engage in topics outside of your background. For the essay, pick something outside of your experience and discuss it succinctly.

What can you gain by working at the State Department?

Working at the State Department allows you to practice storytelling— you cannot trust that people will care about what you care about, so you must convince them. You have to apply just the right amount of pressure to avoid politicians being burned out or letting the task fall through the cracks. As a member of the State Department and a federal employee, it is your job to be a good soldier and bring a diplomatic face to everything. There is no pride of ownership for federal employees. Instead, you provide a web of experts to connect and guide policy makers. Also, you must dress up every day (very different from life in the lab).

Dr. Jessica Petrillo: Worked to figure out how to combat global antibiotic resistance by building up from G7 to G20 to U.N. and creating social norms. She worked within a 3-year span, as that is about the maximum attention span available to a specific project in government. Also, she got the Vatican involved to mobilize faith-based calls to action. Her general advice? You can either do the task you're assigned or figure out the opportunity available to you – seeking the opportunity will take you farther. Dr. Petrillo recognized that having a PhD could be very helpful at the State Department, in part because it gives you skills in multi-year planning.

Dr. Benjamin Schmitt: Having a diverse set of ideas is key to problem solving, so Dr. Schmitt believes that all teams, particularly those in the national security bin, should have a scientist. The State Department requires exceptional generalists, not experts, as they can readily convene experts in any field. When you work for the State Department you are the face of America abroad.

The National Academies of Sciences, Engineering, and Medicine (NASEM)

Authors: Clara Meaders

Date: April 6th, 2017

Meeting with:

Anne-Marie Mazza, Director of Committee on Science, Technology and Law

Overview

The National Academies was created by Abraham Lincoln in 1863 to advise the nation, and consists of three membership organizations: the national academies of science, engineering, and medicine. It is a nonprofit organization that is independent of the federal government. However, as a soft money organization, NASEM relies on government funding, and 75-80% of its work is done for the government, often directly commissioned by acts of Congress.

Missions of NASEM

1. To recognize excellence in science, engineering, medicine: its members are peer elected based on their contributions to science, industry (engineers), and the practice of medicine.
2. To promote the well being of the research enterprise. For example, by making statements about whether political actions are in the interest of science such as the current budget or immigration restrictions. The NASEM seeks to look at the whole ecosystem of science in this country and offer advice.
3. To advise the nation on issues of science and engineering. They look at issues of science for policy (e.g., how much arsenic is tolerable in water) and policy for science (for example, optimizing the nation's standards for research - e.g., what a grant proposal should look like). They also conduct studies requested by Congress or federal agencies, or sometimes NASEM itself comes up with ideas for studies and they try to find funding.

Role of NASEM

NASEM differs from other scientific agencies in that they are nonpartisan and independent, so can make recommendations on behalf of the nation. Their goal is never to make the sponsor happy, but to do what is best and evaluate the evidence fairly. When they take on an issue they make a concerted effort to bring in all relevant stakeholders, not just academics. They can take on contentious issues because they are nonpartisan. For example, they have done several reports on climate change that reiterate the consensus view and have been well received. They are mindful that although they try to incorporate all the best science, not everyone will listen when NASEM speaks, and NASEM will not always be at the forefront of every issue.

Reports at NASEM

The reports that NASEM produces range from workshop summaries (such as the CRISPR/CAS9 summit where different groups from 70 countries came together over 3 days) to consensus studies that are carried through the different standing committees. All the reports are free and available for download. Even for classified studies, non-classified versions are published online.

The standing committees meet 2-3 times per year and are made up of scientists and stakeholders. The scientists are elected by their peers, but, because they must volunteer their time, tend towards older scientists, though efforts are underway to diversify the scientists that NASEM relies on. In the case of the Committee on Science, Technology and Law, the committee is 50% scientists and 50% lawyers.

To pay for a NASEM study, Congress can request that an agency pay for it. Occasionally this has backfired when the organization delays payment. Because NASEM is nonpartisan, there can be tension from soft money funding, and NASEM is mindful of the conflict of interest. They work hard to identify and incorporate stakeholders, but worry about one individual becoming the representative for an entire group.

Example of successful studies

In 2009 NASEM, published a report on the validity of forensic sciences. There were significant challenges getting the report funded and published. The Justice Department was not interested; the DoD wanted to select committee members and get a preview before publication. Ultimately, NASEM walked away from the contract to preserve their integrity (\$750,000 contract). Ultimately, Barry Fisher wrote a request for the funding into the appropriations for the Justice Department. Though the Justice Department ignored the request for a year, they were ultimately pressured to pay by Congress.

Once the study began, NASEM put together a committee of scientists and stakeholders. Their finding was that the system was broken and very few of the forensic techniques commonly used in court were truly accurate, and that, except for DNA evidence, no evidence could reliably match a suspect to a forensic sample. The report was sent to 24 reviewers who gave feedback that allowed NASEM to improve the clarity of the language (but not change the findings). This report got a lot of press, parts of it were leaked to the New York Times two weeks before publication, and the Justice Department was not happy with the finding, but it has led to a shift in the way that forensics are used in the courts.

Fellowship recommendation

The Mirzayan Fellowship: 26 individuals spend 12 weeks at NASEM working within different committees. As a fellow, you get to go to briefings, hearings and more. You can apply as a graduate student, or after graduate school.

Strategic Marketing Innovations (SMI)

Authors: Madeleine Jennewein and Caitlin Nichols

Date: April 6th, 2017

Meeting with:

Anna Kusnir PhD, Vice President for Life Sciences
Damian Kunko, VP for Business Development (renewable energy expert)
Paul Gay, Vice President (renewable energy expert)
Drew Ronneberg, PhD, Vice President (energy and chemistry expert)

Overview

Strategic Marketing Innovations (SMI) is a lobbying firm that “supports companies, universities, and trade associations to advocate for federal policies that enable technology commercialization and growth.” SMI policy and technical experts and lobbyists pursue this goal by advocating for federal funding increases and policy changes that support the interests of their clients. SMI also assists clients by connecting them to important people on Capitol Hill through other clients (companies, labs, universities, etc.). Working at SMI requires social savvy, an extensive network, and knowledge of the governmental/legislative process.

SMI has existed for 20 years and employs 12 professionals. Together, they manage 72 clients in 36 states and over \$250 million in funding activity. Among these clients, they represent 10 universities. SMI is constantly looking for new clients, and a key attribute for an employee is an ability to bring clients to the firm immediately.

Meeting with

- Dr. Anna Kushnir is an alumna of the Harvard Virology PhD Program (2008). Dr. Kushnir advises clients on which agencies to seek funds from and how to position or frame client technologies to generate interest. Dr. Kushnir is not a lobbyist. Specifically, she works with universities and researchers to get grants for technology development.
- Damian Kunko primarily works as a lobbyist assisting companies, trade associations and universities. Mr. Kunko has secured over \$350 million in federal funding, primarily for energy and defense R&D clients.
- Dr. Drew Ronneberg (Vice President) received a PhD in biochemistry from Princeton University and subsequently worked at the Department of Energy (DoE). He develops strategies to interest government agencies in funding client technologies, including through face-to-face interactions (rather than traditional grant applications).
- Paul Gay has worked for many legislators on Capitol Hill “focusing on congressionally directed projects and issues related to energy and climate change, agriculture, space, telecommunications and transportation” (www.strategicmi.com). Mr. Gay leverages his extensive experience and network on Capitol Hill to help clients secure federal investments in their developing technologies.

Work at SMI

Experts at SMI support clients on two main tasks: 1) obtaining specific federal funding (“getting a slice of the pie”), and 2) expanding overall federal funding in a sector by identifying gaps in funding (“expanding the size of the pie”). This is often a lengthy process over many years.

For example, one of SMI's clients is a company that manufactures a new form of vaccine that may be particularly useful for immunizing against Dengue fever. Dr. Kushnir assisted this company by working with the DoD to craft a new grant that funds innovative Dengue vaccines. She then worked with the company to write a grant proposal that would be particularly competitive for this new pool of funds.

SMI also advocates for increased funding in the marine renewable energy sector. Much of federal clean energy spending goes toward developing wind and solar technologies, which are now relatively mature and well funded on their own. SMI lobbyists help legislators understand the value of investing in new marine energy technologies, which rely on the consistent forces of waves, tides and ocean currents rather than sometimes-fickle wind and sunshine.

A critical part of SMI's mission is to understand the investment priorities of different agencies to determine where a technology may have the best chance of securing funding. For example, SMI worked with a small business owner who makes high-strength steel. High-strength, lightweight steel would allow for lighter, more energy efficient vehicles, and so SMI directed this individual to seek funding from the DoE. As a result, the business owner secured a \$150,000 small business innovation research grant.

President Trump's proposed budget may affect the lobbying landscape, as smaller companies and universities are concerned about funding cuts; small businesses may choose to stop hiring advisors/lobbyists to help with obtaining funding because of the decreased chances of success. On the other hand, SMI professionals have seen larger companies ramping up their efforts to obtain funding to increase their competitiveness in a potentially difficult funding market.

The National Institutes of Health

Author: Jamai Nwanaji-Enwerem

Date: April 6th, 2017

Meeting with:

Stephanie L. Courchesne Schlink, PhD, Health Science Policy Analyst
Lyric Jorgenson, PhD, Deputy Director of NIH Office of Science Policy
John Burklow, Director of NIH Office of Communications & Public Liaison

Overview

The National Institutes of Health (NIH) is an agency under the United States Department of Health and Human Services that focuses on biomedical research. The NIH consists of 27 separate institutes and centers. The NIH is committed to building a broad foundation and using broad demographics for the basis of its research. It has many traditional grant-making operations to fund science around the country, as well as specific high-priority initiatives that fall outside of R01 grants.

The Office of Communications

This office supports the NIH Director's communications efforts and those of other NIH leaders, and coordinates communications across all 27 NIH institutes and centers. It engages reporters, editors, producers, and the public. The key messaging concepts they work on include the value of investing in medical research; the health impact of NIH research; the economic impact of NIH research in sustaining U.S. competitiveness; the importance of basic, clinical, and translational research; and the footprint/impact of NIH and the \$30 billion of funding the NIH distributes throughout the country. The NIH Director approaches communications through media interviews, social media, speeches/presentations/visits, visits to the NIH, commentaries/op-eds/scholarly papers, and scientific initiatives. Dr. Collins has made over 985 presentations since starting as the NIH Director.

Office of Strategic Coordination

This office manages the science fund and a set of interdisciplinary science programs. It involves a team that manages planning, evaluation, policy and communications. The team helps write a spending narrative that goes into the President's annual fiscal budget. The OMB (Office of Management and Budget) then sets the amount of funding and the office of strategic coordination helps write out how to spend the allotted amount. Most institutes have multiple forms of internal budgets that they can work with in the case there are budget cuts.

Science Policy at the NIH

Policy at the NIH is at the very broad scale of establishing priorities for how science is conducted and what science needs to be funded. The NIH doesn't want to be heavy-handed with scientific initiatives, but instead funds the best science and tries to find a balance between good science and the pressing issues of the day. They specifically fund several top-down initiatives to cover these big-ticket items, such as the Precision Medicine Initiative, the cancer moonshot, and the BRAIN initiative – often based on executive authority. Within the policy office they have about 60 employees, of which 75% are scientists, who work together on setting priorities and policies within the NIH.

Pew Charitable Trusts

Authors: Garrett Dunlap

Date: April 6, 2017

Meeting with:

Carolyn Shore, PhD, Officer, Antibiotic Resistance Project

Chuck Shih, PhD, Senior Officer, Drug Spending Research Initiative

Karin Hoelzer, PhD, Senior Officer, Health Programs

Overview

The Pew Charitable Trusts is a non-profit organization founded in 1948 when the Pew family pooled several individual trusts. The foundation seeks to impact policy in many sectors, including healthcare and the environment. In some ways, the areas worked on today harken back to the interests and occupations of the Trust's original founders. The Trust seeks to work on areas otherwise not being looked at by other groups. While the trust also funds the Pew Research Center, the staff and operations of the Trust and the Research Center largely remain separate.

Work at Pew

Pew conducts research and writes reports on pressing issues, then moves into advocating for particular policy stances surrounding those issues. They aim to conduct thorough research about particular topics, including detailed analyses of potential policy solutions. Because Pew is run by a trust, the process can be very bureaucratic and process driven, involving heavy vetting and review before initiating projects or settling on particular policy stances.

Opportunities and Career Advice

After graduating from the Biological and Biomedical Sciences PhD program at Harvard, Carolyn entered the science policy world through an American Association for the Advancement of Science (AAAS) fellowship. She highly recommends it to anyone with a PhD that would like to step into the science policy field. Good writing skills and flexibility, and an ability to learn new topics quickly are key skills to succeed in science policy.

Careers at Pew are often highly specific, tailored to the exact projects that Pew has ongoing for PhD-level hires. Once a project ends, though, people can move on to very good careers outside of Pew, or potentially change projects within the Trust. Their day-to-day work involves a lot of stakeholder meetings and crafting policy, as well as time spent researching and writing. Their time can also include traveling to conferences and writing peer-reviewed publications (highly encouraged at Pew).

The White House Office of Science Technology and Policy

Authors: Bram Maasackers and Terence Wong

Date: April 7th, 2017

Meeting with:

Meredith Drosback, PhD, Assistant Director, Education and Physical Sciences

Eleanor Celeste, MS, JD, Assistant Director for Biomedical and Forensic Sciences

Overview

The White House Office of Science and Technology Policy (OSTP) was established by Congress in 1976 to provide the President with advice on the scientific, engineering, and technological aspects of the economy, national security, homeland security, health, foreign relations, the environment, and the technological recovery and use of resources. OSTP also leads interagency science and technology policy coordination efforts, assists the Office of Management and Budget (OMB), and serves as a source of scientific and technological analysis and judgment for the President.

The work at OSTP

The mission of OSTP is to provide the President and senior staff with accurate, relevant, and timely scientific and technological advice on domestic and international affairs, to ensure that the policies of the Executive Branch are informed by sound science, and to ensure that the scientific and technical work of the Executive Branch (across science policy groups in federal agencies) is properly coordinated. Under President Obama, the work of OSTP fell into four main topic areas: Environment & Energy (climate change, sustainable development, and new and cleaner sources of energy), National Security & International Affairs (cybersecurity, biological threats, nuclear threats, intelligence capabilities, and international S&T cooperation), Science (research and STEM education), and Technology & Innovation (communications infrastructure, education upgrades, manufacturing technologies).

OSTP's main power is to convene and coordinate. The balance between advising and coming up with plans (memos to be sent to the President) depends on the character of the portfolio and varies over time. The size of OSTP has varied strongly between different administrations; the office was heavily used during the Obama years. OSTP is required to have an executive director who is often the science advisor to the president, as well. OSTP currently does not have a director, meaning that while projects continue, no new projects are taken on. However, this situation is not unusual: it typically takes a while after a transition for the office to be completely online again.

The Director of OSTP is also co-chair of the President's Council of Advisors on Science and Technology (PCAST), which is made up of science, technology, and innovation experts from outside the government. OSTP (and PCAST) were very prominent in the Obama administration, with over 140 people on staff.

During the Obama administration, OSTP was deeply involved in the creation of the 21st Century Cures Act, the cancer moonshot, the BRAIN Initiative, and the Precision Medicine Initiative (PMI). The main role/function of OSTP is to convene meetings with the science policy groups of other federal agencies, including NIH, NSF, etc. While OSTP does not do a lot of policy implementation, its strength lies in thinking about “the big picture” landscape of science policy and in creating partnerships between federal agencies. For example, the Precision Medicine Initiative involves the NIH, FDA, DoD, VA, and DOE.

Working for OSTP

Meredith Drosback has a PhD in astrophysics, did two postdocs before she became AAAS fellow, and started at OSTP in 2012. Her portfolio includes STEM Education, focusing on topics like space science, super computing, and forensics. Eleanor Celeste worked on the All of Us Research Program (AKA the precision medicine initiative), cancer moonshot, forensics, biosafety, and the BRAIN Initiative. She has a scientific background, including a graduate degree in Biohazardous Threat Agents & Emerging Infectious Diseases, and is a lawyer.

Knowing people across different agencies is vital for OSTP’s personnel. They must be up-to-date on the literature but also know who to call for expertise. The key is to put everything together. OSTP can provide a neutral voice, without the specific perspective of a department, and is able to facilitate collaborations between agencies.

Internships at OSTP

There are (unpaid) internship opportunities at OSTP. Applicants are judged on why they are interested in OSTP specifically, their writing skills, being open to working on a large range of topics, general communications skills, and being able to work independently.

Department of Education

Authors: Olivia Foster and Clara Meaders

Date: April 7th, 2017

Meeting with:

Christina Chhin, Program Officer for Mathematics and Science Education, Institute of Education Sciences

Jessica Torres, MA, Education Specialist, Office of Education Innovation Programs, Office of Innovation and Improvement

Kelly Terpak, Deputy Director, Office of Education Innovation Programs, Office of Innovation and Improvement

Debora Southwell, MA, Management and Program Analyst, Office of Education Innovation Program, Office of Innovation and Improvement

Ellen Lettvin, Office of STEM, Office of Innovation and Improvement

Overview

The Department of Education has four centers that focus on education research. They primarily fund grants in three tiers: development (3 million), validation (12 million) and scale-up (20 million). These grants particularly target STEM education in high-needs communities.

Researchers (school districts and nonprofits) can apply for research grants to fund work on education at the pre-K level up through the postsecondary level. Each applicant must have independent evaluation and grantees partner with independent evaluators. The Department of Education also manages the What Works Clearinghouse, which reviews published evaluations and compiles lists of successful educational initiatives. They provide ratings to studies based on research design studies' demonstrated impacts.

Department of Education within the wider government

Generally (and perhaps sometimes frustratingly) the Department of Education has no authority to make policy regarding how schools function. Instead, these regulations are state-specific. While the Department is working to make evidence-based parameters the norm, a federal curriculum will likely never be the norm in American schools. A recent bill, the Every Student Succeeds grant, hopes to make it easier to create and disseminate What Works Clearinghouse standards that are different for rural and urban communities to promote more tailor-made education.

Federal role in funding schools is not the majority. Instead most are funded by non-competitive grants such as formula grants (Title IX, Title I, etc.) There is no single funding stream for STEM-only research. However, there are currently ~60 programs and initiatives for which STEM is the dedicated priority.

Current work at the Department of Education

In general, the Department of Education is pushing for more active learning and less textbook-driven STEM curricula. One recent grant to the University of Missouri funds the creation of 'Challenger Centers,' which use simulations and virtual reality to immerse students in scientific problems. The Precision Education and Virtual Learning Labs also follow this same principle.

The Department of Education has found one approach to science education particularly useful and effective. This requires creating an out-of-school STEM ecosystem where students and families can interact with science in their own time and in a more relaxed setting. Six groups are integral to this ecosystem: family, K-12 schools, local businesses, higher learning initiatives, non-academic centers (such as libraries, museums, and zoos), and formal out-of-school educational options. The after-school, low-stakes context is key for students to get involved and interested in learning.

In some circles, there is a push to integrate STEM with the arts, moving from STEM education to STEAM education. However, it is a complicated issue, as each discipline wants to be treated distinctly, and there are pedagogical challenges that come with trying to integrate too many subjects simultaneously. On the other extreme, there is also a problem of self-silo in which the arts and STEM self-segregate into unique own disciplines. Neither extreme is good for students.

Harvard Office of Federal Relations

Author: Michelle Frank

Date: April 7th, 2017

Meeting with:

Jon Groteboer, MIA, Director of Federal Relations

Overview

Harvard's [Office of Federal Relations](#) (OFR) consists of a small group of people tasked with representing the interests of Harvard and other scientific and academic institutions in Washington. They primarily focus on tax priorities, immigration policy, labor issues, and education policy. Harvard is not alone in this project: in fact, most major research universities have some presence in Washington to lobby for their interests. These institutions largely work together as large coalitions of scientific research groups, trade groups, or universities to lobby congress for policies that will help science and academia. These coalitions help to create unified narratives around the importance of issues, since each institution has limited persuasive power on their own. They then target individual members of Congress to lobby for or against pieces of legislation that will either help or hinder academic and scientific institutions. Because they can't offer large campaign donations the way major industry groups can, university lobbyists tend to focus more on science and academia's roles in creating jobs and the general importance of scientific research and education. Harvard's OFR can also act as a contact in Washington for faculty who are worried about a new law's potential influence on their research.

Department of Health and Human Services— Assistant Secretary for Preparedness and Response (ASPR)/Biomedical Advanced Research and Development Agency (BARDA)

Authors: Madeleine Jennewein

Date: April 7th, 2017

Meeting with:

Jessica Appler, PhD, Acting Director of Division of Quantitative Analysis, BARDA
Karl Erlandson, PhD, Project Officer, Division of Influenza and Emerging Infectious
Diseases,
BARDA, ASPR

Leremy Colf, PhD, Director, Disaster Science, Office of Policy and Planning (OPP), ASPR
Robin Moudy, PhD, Branch Chief, International Partnerships, Division of International
Health
Security, OPP, ASPR

Overview

The Biomedical Advanced Research and Development Agency (BARDA) is an agency within the U.S. Department of Health and Human Services under the Office of the Assistant Secretary for Preparedness and Response (ASPR). It was created in 2006 following Hurricane Katrina through the Pandemic and All-Hazards Preparedness Act. BARDA works to promote the development of vaccines and therapeutics to prepare against emerging pathogens, bioterrorism, and nuclear threats. Principally, they manage pharmaceutical development and specific scientific programs funded under Project Bioshield (2004). They also procure materials for the Strategic National Stockpile, and they coordinate the national Public Health Emergency Countermeasures enterprise during deployment and manage the inter-agency response.

ASPR, the overarching agency, focuses on disaster preparedness and planning, including building operational capacity and adding to the science of disaster management. Scientists work within ASPR to respond to a wide variety of threats, building plans and capacity as well as working on the science of disasters, to improve the process in the future

BARDA is organized into four divisions:

- Division of Chemical, Biological, Radiological and Nuclear Medical Countermeasures
- Influenza Division
- Division of Regulatory & Quality Affairs
- Strategic Science and Technology

Drug Development at BARDA

BARDA works primarily through contracts with companies, not with researchers, because of the highly specific goals they have, and works either to answer particular scientific questions or to develop therapeutics. BARDA is cast in the mold of DARPA, which seeks to fund advanced technologies in their infancy. They see themselves as the venture capital for the government, investing in the most promising countermeasures in their early development, and subsequently buying and stockpiling them for the government and planning distribution infrastructure. They have many industry partners, both small and large, and work closely with them to navigate the many challenges of bringing a drug to market. Currently they are trying to recreate the accelerator format in a virtual way to spawn more drug development and investigate other funding models.

Though BARDA does work with the DoD, which also develops drugs, BARDA is mandated to serve as the advanced research and development group for the American public, not the military. Thus, their considerations are often very different from those of the military, particularly in consideration of different demographics. They must be sure that any drug they develop is appropriate for all people—including the elderly, children, and pregnant women—and can be accessed and distributed fairly following an epidemic. Therefore, they will work with the DoD to extend licensing of certain drugs, but often have different priorities. They also work with the DHS to plan which threats to respond to and which countermeasures to work on.

Careers at ASPR/BARDA

Quantitative analysis is a core service at BARDA in which many data scientists are employed. Scientists at BARDA are also involved in writing policy or serving as science advisors to the agency. Within BARDA, roughly one-third of employees are PhDs, another one-third have postdoctoral experience, and the remaining one-third have other experience. Because the work at BARDA can closely resemble the work of a principal investigator in academia, such as directing the research of others, doing a postdoc can provide valuable experience. The AAAS fellowship is also very valuable, and BARDA hires many former fellows.

Government Accountability Office

Authors: Rachel Silvern and Jamaji Nwanaji-Enwerem

Date: April 7th, 2017

Meeting with:

Tim Persons, PhD, Chief Scientist

Karen Howard, PhD, Assistant Director (Physical Sciences)

Scott Fletcher, PhD, Senior Scientist, Applied Research and Methods, Center for Science, Technology and Engineering

Overview

The Government Accountability Office (GAO) is a non-partisan agency within the legislative branch that works with Congress to help improve the performance of legislation and ensure accountability of the federal government. More specifically, the GAO provides investigative, auditing, and evaluation services to Congress. The GAO is headed by the Comptroller General (CG), who is appointed by the president serve a 15-year term. However, there are no other political appointees at the GAO. At its inception in 1921, it was primarily conducting financial auditing, but its efforts shifted starting in 1970 to include performance auditing. Its purview includes the entire federal government, except the Federal Reserve and Federal Intelligence Agencies. Historically, GAO worked for the majority in Congress, but in 1992, GAO's budget was slashed by the Republican Congress and it was then that GAO decided they must weigh requests from both parties equally when deciding their priorities.

Workflow of auditing

The GAO has a dynamic queue of priorities and while they can get requests from any member of Congress, they prioritize requests from committee chairs and ranking members. They publish about 1,000 reports each year out of 2,000-3,000 requests. They normalize requests from Congress to be nonpartisan to de-politicize the issues because they are a non-political entity. Additionally, the GAO considers the legislative calendar as it works to address letters with appropriate haste.

Members of Congress mostly request their services in a letter to CG (this accounts for 85% of all requests). However, due to the large volume of requests, usually only work submitted by ranking committee members or committee chairs will merit action by the GAO. 10% of GAO's work is directly mandated by Congress, and the last 5% of the work is chosen and authorized directly by the CG.

GAO reports

Like other agencies, GAO generates scientific reports. GAO does science for policy and has a sister group, the Congressional Research Service, that does policy for science. GAO has 14 teams organized by subject areas at dozens of locations around the country (including in Boston). All GAO reports are publically available online. Topics of existing reports are vast but include 3D printing, climate change, water use in the energy sector, and data analytics and innovation.

The timelines, perception of report authority, and costs differ within the agencies. Work done by the National Academies is most expensive, carries the greatest perception of authority, and can take from 24-36 months to complete. Work done by agencies like the Congressional Research Service is on the lower end of this scale. GAO is somewhere in the middle. For instance, the timeline for completing a GAO study is approximately one year. However, GAO has a standing contract with NASEM and GAO often relies on their ability to convene stakeholders and experts.

GAO is particularly interested in exponential problems such as climate change, healthcare costs and cyber security. For example, they issued a report on Climate Engineering Technologies (GAO-11-71) that was requested by the then-Chairman of the House Science Committee to investigate the status, pros and cons, and policy implications of geo-engineering. In general, the goal of GAO reports is not to change minds; rather, they strive generally to be pro-America and pro-society. Their best work will not satisfy either side entirely, although Congress may choose the parts of the report that they want to put into action.

GAO also gives the agencies they are advising or investigating the ability respond to reports prior to publication, and they print the agency's letter at the back of their report as 3rd party verification. Over half of their reports make policy recommendations to agencies. They can also recommend laws for congressional consideration, particularly if there are conflicting statutes on the books. GAO follows up on agency recommendations every four years, and it depends on the agency whether their recommendations are regularly acted upon. While GAO has no authority to enforce their recommendations, Congress may write legislation based on their reports to enforce a policy recommendation.

The advantages of working at GAO are the breadth of topics they work on, trust from Congress and the media, and their research heft: GAO is the only science policy agency with full access to data and statistics from other governmental entities, as well as the resources to collect their own data if they do not have it already.

Three thousand people work for the GAO, and they have an operating budget of \$567.8 million (FY-17), which is appropriated by Congress. Last year, GAO saved \$115 for every \$1 it spent. One-third of their employees work outside of Washington D.C.