THE NEW ATLANTIS
A JOURNAL OF TECHNOLOGY & SOCIETY

Science and Congress

Adam Keiper

The proper relationship between science and politics in America is a large and complicated problem. Modern science helps make the democratic way of life possible, by making the necessities of life and the dream of improvement available to everyone. But in crucial respects, modern science also involves levels of expertise and complexity unavailable to most citizens, even as it profoundly affects their everyday lives. Aristocratic scientists and democratic policymakers—the nation's experts and the people's representatives—usually speak different languages and live in different worlds. And yet these worlds must very often meet, perhaps more so today than ever before, with great consequences for every dimension of American life. Policymakers are called upon to make judgments and decisions for which they need serious and reliable scientific advice, while the advances made in laboratories have far-reaching social and political consequences that scientists are ill-equipped to understand on their own.

For many years, the executive branch has made much use of scientific expertise, and has employed thousands of scientists in the various agencies and departments of the government. There are certainly gaps and problems with the way the executive bureaucracy relates to the scientific community, but there are also clearly established channels of communication and cooperation. But in the legislative branch, the most democratic component of the American system, the need for scientific advice and expertise is great, but for the most part poorly met. For more than two decades, from the 1970s to the 1990s, a congressional agency called the Office of Technology Assessment (OTA) sought to bring scientific expertise into the legislative process. But the agency was abruptly dismantled a decade ago, leaving Congress without a specific institutional vehicle for getting science and technology advice and analysis. The story of the agency's creation, accomplishments, and elimination tells us a great deal about the complicated relationship between American politics and American science, and understanding the legacy of OTA may be a crucial first step toward developing better institutions for governing—and governing with—modern science.

Adam Keiper *is managing editor of* The New Atlantis.

The Rise of Science in America

OTA is of course a recent chapter in a long story, and grasping its significance requires a brief history of the ascendancy of modern science in modern politics, especially American politics. In the beginning, you might say, was Francis Bacon. He understood "the force, effect, and consequences" of inventions and discoveries; he grasped how they could change "the appearance and state of the whole world" beyond the ability of any "empire, sect, or star" to do so. While civil and political decisions might benefit some people in some places for a while, Bacon argued that "the benefits derived from inventions may extend to mankind in general … forever." In his parable "New Atlantis," from which this journal takes its name, he tells of an imaginary land where a rational elite guides scientific pursuits aimed at "the effecting of all things possible." Bacon's writings call for the creation of institutions that sound eerily like the foundations, universities, and research centers that have been founded since his death. Insofar as science and technology are central to our lives, we inhabit the world Bacon envisioned; insofar as we are not ruled by technocrats, Bacon's vision remains unfulfilled.

The Enlightenment showed the power of Bacon's confidence in scientific meliorism, with the creation of scientific societies and institutions that bent the minds of communities of savants toward understanding the natural world. This period saw the hiring of scientists by the state, the application of scientific knowledge to the many problems of human life, and advances in engineering, navigation, anatomy, and agriculture.

The American Founders were very much men of the Enlightenment, and the Constitution they established can be understood as a sort of "technology of politics," to borrow Daniel Boorstin's phrase—a great faction-taming machine. Several of the Founders had a passing interest in scientific affairs and a few were deeply involved in them—most famously Benjamin Franklin and Thomas Jefferson. Both were inventors and both were skeptical about the wisdom of patents, even though Franklin helped write the Constitution that explicitly permitted patents in order to "promote the Progress of Science and useful Arts," and Jefferson himself was the first head of the patent office. In various official documents and state papers—like Jefferson's 1790 *Report on Weights and Measures* and Alexander Hamilton's brilliant 1791 *Report on Manufactures*—the Founders suggested a central role for science and technology in America.

A great-grandson of Ben Franklin played a part in one of the first congressional forays into seeking scientific advice, as part of a Franklin

Institute panel charged by Congress in 1832 with finding the causes of exploding steamboat boilers. The researchers issued their report in 1836, and Congress followed their advice in creating what would become the federal government's first regulatory agency.

As the nation grew and the Industrial Revolution advanced, new American institutions related to science and technology began to pop up all over. The American Society of Geologists was founded in 1840; it became the American Society of Geologists and Naturalists in 1842; and finally in 1848 became the American Association for the Advancement of Science. The Smithsonian Institution was established in 1846 "for the increase and diffusion of knowledge among men." The Society of Civil Engineers and Architects was founded in 1852; over time it splintered into several organizations still extant. The American Medical Association was founded in 1847 and the American Dental Association in 1859. And at the height of the Civil War, Congress incorporated what would become the greatest of the American scientific organizations: the National Academy of Sciences. It was established in 1863 to "investigate, examine, experiment, and report upon any subject of science or art" and to offer advice to the government whenever asked.

The federal government eschewed basic research through the nineteenth century, choosing almost exclusively to finance science with some practical value. Thus, the federally-funded land-grant colleges which began to spring up in the 1860s conducted research aimed at improving American agriculture, while the pursuit of scientific knowledge without apparent utility was left to privately-funded research universities, starting with Johns Hopkins University in 1876. The progress of science during the second half of the nineteenth century was so rapid that some observers hoped to see the fulfillment of the Baconian vision of a scientific elite. The Englishman Francis Galton, now remembered as the father of eugenics, expressed in 1874 his desire to see arise a "scientific priesthood"—a term he coined—"whose high duties would have reference to the health and well-being of the nation in its broadest sense, and whose emoluments and social position would be made commensurate with the importance and variety of their functions."

The turn of the century saw increasing industrial investment in systematic research and development, and corporate labs that slowly developed ties with research universities. Philanthropic largesse—primarily money from John D. Rockefeller and Andrew Carnegie funneled through eponymous institutions—also brought millions of dollars into research.

Government need for scientific expertise in the form of regulators and inspectors grew during the Progressive Era, and numerous science-related agencies were born.

World War I led to greater cooperation between government, industry, and universities on militarily useful science and technology projects, and saw the creation in 1916 of the National Research Council, the "operating arm" of the National Academy of Sciences. But this closer relationship didn't last: Just as the U.S. military was "downsized" after the war ended, so too were there major reductions in government funding for science. The term "technocracy," coined in 1919, came into vogue in the 1930s as rational, centralized planning came to be seen as the antidote for the woes of the Depression. Several studies issued during these interwar years decried the disorderly state of American science and the failures to anticipate the consequences of new technologies. The foremost of these, a 1937 National Resources Committee report called "Technological Trends and National Policy," criticized the country's lack of technological foresight: "Though the influence of invention may be so great as to be immeasurable," the report said, "there is usually opportunity to anticipate its impact upon society since it never comes instantaneously without signals." Several specific inventions—including air conditioning, plastics, and television—were singled out for special scrutiny. The 1937 report is a paragon of that era's blossoming technocratic approach, bringing together both a conviction in the power of technology to transform the world and a characteristic confidence in man's ability to direct its development.

World War II changed everything for American science. The entire nation mobilized and organized for the war effort, including scientists. Scientists in lab coats worked closely with uniformed military men and pin-striped politicians to establish new agencies, laboratories, and research projects. Science, industry, and government cooperated more closely than ever before. "Big science"—large research programs requiring expensive equipment and big staffs—was made possible with government support. The major inventions that resulted, especially radar and the atomic bomb, were essential for securing the Allied victory.

When the war was won, a grateful nation showed its appreciation by tremendously increasing funding for science. Before the war, government paid for little of the basic scientific research conducted in America, but since the early 1950s more than half of such research has been supported by the government. With the creation of the National Science Foundation in 1950 (after several false starts) the nation had a new agency to guide

the growing American scientific enterprise by bestowing grants and fellowships. Government funding for medical research through an older organization, the National Institutes of Health, also mushroomed in the 1950s. As one writer put it, science was no longer "an orphan." The dependency of science on government money (and of government on scientific advice and achievement) deepened irreversibly.

In these postwar years, scientists also came to enjoy wider public respect. According to one Manhattan Project scientist, physicists "were exhibited as lions at Washington tea-parties, were invited to conventions of social scientists, where their opinions on society were respectfully listened to by lifelong experts in the field, attended conventions of religious orders and discoursed on theology, were asked to endorse plans for world government, and to give simplified lectures on the nucleus to congressional committees." The executive branch established several new mechanisms for formally and informally obtaining scientific advice, including the installation of scientific advisors in government agencies and departments and the establishment of a central science advisory committee to the president.

It was also during these early years of the Cold War that scientists split sharply over the question of nuclear weapons, with some leading researchers actively campaigning against the bomb and others working to create next-generation nukes. (This divide still reverberates in the world of science politics, and some of the anti-nuclear organizations founded by scientists as early as 1945 are still active today.) Congressional concern about communist scientists working in sensitive positions led to investigations of scientists' loyalties in the 1940s and early 1950s by the House Committee on Un-American Activities, the Joint Committee on Atomic Energy, and Joseph McCarthy's Senate Permanent Subcommittee on Investigations. These concerns were only exacerbated by the exposure of the atomic spy ring. During this period, the relations of American scientists to Congress were "almost exclusively concerned with security and not with science and its social and political implications," as Harvard professors J. Stefan Dupré and Sanford A. Lakoff noted in their 1962 book *Science and the Nation.* "It would seem that the public and its legislative representatives simply had very little understanding of the role of the scientist in society and politics, and even less appreciation for the problems the scientists were trying to call to their attention."

That changed somewhat in the aftermath of the Soviets' 1957 Sputnik success, which galvanized American science and launched the space race. NASA was created, school science courses were revamped and toughened,

federal spending on R&D began to climb steeply, and the presidential science advisory position was formalized. For the first time, Congress established committees with specific jurisdiction in science and technology: the Senate Committee on Aeronautical and Space Sciences (1958) and the House Committee on Science and Astronautics (1959).

In his January 1961 farewell address, President Eisenhower warned famously of the "military-industrial complex," but also worried more broadly about the relationship between science and government. We should "gravely" regard the "the prospect of domination of the nation's scholars by federal employment, project allocations, and the power of money," Eisenhower said. But "we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological elite."

The danger Ike warned of—like Galton's hopes for a "scientific priesthood" or Bacon's wish for a ruling scientific elite—has not come to pass. It is true that, since Eisenhower's day, the role of science advice in government has continued to grow in influence—so much so that one political scientist has called federal science advisory committees the "fifth branch" of our government (the "fourth branch" being the regulatory agencies that rely heavily on science advice). But we are hardly ruled by a scientific elite. In fact, the basic structure of the federal government's scientific apparatus has not changed significantly since Eisenhower's time. Yes, every year brings changes—agencies get consolidated, projects get canceled, job titles get changed around, new initiatives get started, scandals end careers, regulatory powers wax and wane, scientific advisory committees proliferate—but the basic outline of America's institutions for governing science and governing with scientific expertise have largely stayed the same. The one major overhaul proposal that has garnered serious attention is the creation of a new Department of Science to bring together many of the science functions spread throughout the federal government. Apparently first suggested in the 1880s, this proposal was batted around in the post-Sputnik years and again in the 1980s and 1990s. Although the idea has some merit—it would probably save money, improve oversight and accountability, and give science and technology permanent standing in the presidential Cabinet—it would be difficult to implement. Science and technology are too tightly and widely interwoven into the warp and woof of our government and society to be locked into just one department.

In the end, what this history shows is that while the relationship between science and democracy in America has evolved over centuries, the

institutions governing the massive scientific-technological enterprise are still quite young. In many ways we are still feeling our way forward, still looking for ways to fit scientific advice into public policy decisions, still trying to resolve the deeper contradictions at the crossroads of scientific expertise and democratic self-governance. The Office of Technology Assessment emerged in the 1970s as one institutional answer to this great political dilemma, one approach to the broad challenge of governing science and understanding its consequences.

The Birth of Technology Assessment

The initial energy for OTA grew out of a skepticism about technology that emerged in the 1960s, mostly on the political left. The modern environmental movement began with the 1962 publication of Rachel Carson's anti-DDT book *Silent Spring*. A young Ralph Nader criticized the auto industry in his 1965 *Unsafe at Any Speed*. And the writings of thoughtful critics of technology's role in society—like Jacques Ellul's *The Technological Society*, first published in English in 1964—became more widely known. There was a certain new sensibility, a growing recognition that even as science and technology make possible the "relief of man's estate," they also create new and unforeseen problems.

This sentiment crystallized in a corner of Congress, where Connecticut Democrat Emilio Quincy Daddario was chairman of one of the science subcommittees in the House of Representatives. A thoughtful lawyer, politician, decorated World War II hero, and Korean War veteran, Representative Daddario began in the mid-1960s to solicit off-the-record advice about science and technology policy from industrial and academic luminaries. As later recounted by historian Sylvia Doughty Fries, the participants "all had been affected by the 'emotional movement… to protect the environment'" and felt "a special sense of urgency" in these meetings.

These consultations resulted in the birth of "technology assessment." (That term, usually credited to Rep. Daddario or one of the lawyers associated with his subcommittee, was first used in a public document in 1966.) As originally conceived, "technology assessment" referred to the study of the effects of technological advancement, with the goal of helping policymakers anticipate and maybe even mitigate the negative consequences of new technologies. Starting in 1967, Daddario proposed legislation that would create a new congressional agency dedicated to this purpose.

Things moved very slowly in Congress for a few years, with four major studies commissioned and at least five incarnations of the

technology assessment bill. But the concept of technology assessment was quickly picked up by academics, who ran with it. In the coming years and decades, a sizeable body of literature attempted to define and develop what came to be seen as an exciting and necessary new discipline. In seminars and workshops, in papers and articles, professors and graduate students theorized endlessly about "technology assessment."

The academics, however, never reached any real consensus. They never developed any clear agreement about what *technologies* should be scrutinized, nor about the meaning of *assessment.* In some instances, technology assessment was treated as forecasting and futurism; in other instances, it had less to do with prediction than with analyzing what was already happening. Some descriptions made technology assessment sound like blustery sortilege; others made it out to be a highly systematic and methodical process, with strict rules and procedures, tools and models. Some scholars honed their technology assessment skills by performing historical assessments on technologies that already exist—like the "retrospective technology assessment of the telephone" published in 1982 by social scientist Ithiel de Sola Pool. Some defined the term so broadly that even science fiction novels might be considered technology assessments. In short, the academic version of technology assessment was (and to the extent it still lingers on, remains) an unruly discipline—one with few disciples but armies of prophets, each with his own interpretation of what technology assessment meant.

In the late 1960s and early 1970s, some critics worried that a congressional office of technology assessment would be an industry-bashing, regulation-loving institution—an "Office of Technology Harassment." Some scientists worried that Congress would try to micromanage the nation's scientific research and development. Other opponents—like management guru Peter Drucker, who said the agency was guaranteed "to be a fiasco"—argued that the long-term impacts of new technologies are fundamentally unknowable.

An Agency of Experts

What finally provoked Congress to create its own science and technology agency was its growing mistrust of and increasing clashes with the executive branch. The relationship between the legislature and the executive would deteriorate terribly with the climax of the Watergate scandal, but even before then there were problems aplenty. The Johnson administration had repeatedly misled Congress about the Vietnam War, and the

Nixon administration was suffering its own credibility problems. In time, members of Congress became uncomfortable "relying on massaged numbers and other unreliable information coming from the presidential branch," according to political scientist Nelson Polsby, so they "began to create a legislative bureaucracy to cope with this challenge." They increased the size of congressional staffs, strengthened the two congressional agencies that already existed, and began to discuss more seriously the creation of a new budgetary agency and a new technology assessment agency.

More than ever before, contentious questions related to science and technology were coming before Congress—including antiballistic missile funding, the supersonic transport project, the future of the Apollo space program, and numerous controversies related to energy and the environment. President Nixon's relationship with his science advisors was fraying. And members of Congress increasingly concluded that they needed their own advice, both to fare better in those particular legislative battles and to give their branch more power against the executive. "We have recognized the important need for developing independent means of obtaining necessary and relevant technical information for the Congress, without having to depend almost solely on the executive branch," said Rep. Daddario in 1970. "In my view, it is only with this capability that Congress can assure its role as an equal branch in our federal structure." Senator Edward Kennedy said much the same thing in 1972, warning that without a technology assessment agency, "the role of Congress in national science policy would become more and more perfunctory and more and more dependent on administration facts and figures, with little opportunity for independent congressional evaluation." And it wasn't just Democrats who were worried about the institutional imbalance. "Let us face it," said a leading Republican on the House Science Committee, "we are constantly outmanned and outgunned by the expertise of the executive agencies."

In 1972, Congress passed and President Nixon signed the Technology Assessment Act, which established the Office of Technology Assessment to "provide the legislative branch with adequate and timely information, independently developed, relating to the potential impact of technological applications." The act left a great deal up in the air. It didn't assign the agency a clear size and never defined the vague term "technology assessment." It did, however, lay out a rigidly bipartisan structure to oversee the activities of the office: a Technology Assessment Board consisting of six

Senators (three from each party) and six Representatives (three from each party), with the chairmanship alternating each Congress between Senators and Representatives. The agency's director was to be appointed by the board. There was also a twelve-member advisory council—composed of the Comptroller General, the head of the Congressional Research Service, plus ten eminent scientists, experienced administrators, or otherwise qualified citizens.

The legislation's lack of specificity meant that there was no clear game-plan in place when the Office of Technology Assessment finally opened its doors in early 1974. The responsibility for getting OTA up and running would thus fall on the shoulders of its first director. For that job, the Technology Assessment Board selected Emilio Daddario, who had left Congress in 1970. The OTA was his brainchild, so who better than him to run the agency?

Daddario had to staff and organize the agency from scratch. He had to determine how best to take orders from OTA's governing board while helping to guide its work. He had to decide how much of OTA's labor should be done by contractors and how much should be performed in-house. He had to fight constantly for political support and funding so the agency wouldn't disappear. He had to smooth over conflicts and disputes within his growing staff. And he had to figure out just what technology assessment *meant* in the real world—would OTA be a major analytical agency or just a clearinghouse for work done elsewhere?

Given these immense challenges, it is not surprising that OTA got off to a rough start, notwithstanding Daddario's political acumen. In late 1975, the outgoing chairman of OTA's advisory council complained of dissatisfaction with "what has been accomplished, compared with what we hoped for and still believe possible." He described the agency's reputation as "mixed," and criticized its focus on immediate problems at the cost of long-term questions of "the social and other impacts of technological advances, including their secondary and tertiary effects, before those effects are upon us." In 1976, the House Commission on Information and Facilities said OTA was falling "substantially short" of expectations, in part because of the agency's "youth and inexperience." These criticisms led *Science* magazine to report that OTA got "Bad Marks on Its First Report Cards."

During this period, the board governing OTA operated like a joint committee of Congress, and several members of the board "were able to place their own staff at the agency," according to political scientist Bruce Bimber's 1996 book *The Politics of Expertise in Congress*. "It was clear to

those inside and outside OTA that the agency's personnel practices provided potential for politicization of studies… undermining the agency's poor reputation among conservatives as well as liberals not on the agency's board."

These hiring practices created a serious controversy in 1977, focused specifically on Democratic Senator Edward Kennedy. Senator Kennedy had been a strong supporter of the agency from its inception; without his support it never would have received its initial funding. His close association with OTA caused many conservatives consternation even before the agency began operating: back in 1973, *National Review* worried that he was going to turn OTA into a "political weapon." Kennedy was the chairman of the Technology Assessment Board during OTA's first two years and became chairman again in 1977—when things blew up. In May 1977, Daddario abruptly resigned from OTA. A week later, a Republican member of the Technology Assessment Board quit because Kennedy had turned it into a "one-man operation." Soon, even a prominent *Democrat* on the board accused Kennedy of using it for his "personal political purposes." Of special concern was the widely-reported claim that Kennedy forced Daddario to quit so that a long-time Kennedy aide could be installed in his place. This incensed conservatives, like *New York Times* columnist William Safire, who wrote that OTA had become "the happy hunting ground for Kennedy apparatchiks," and said "we can expect a flow of reports from the politicized Office of Technology Assessment in the future that will show how right Senator Kennedy is on everything from medical research to mass transit, with the scientific community's seal of approval on everything that puts consumerism over the fight against inflation, environmentalism over employment."

Senator Kennedy denied that he was trying to monopolize OTA. And for his part, Daddario denied that he was forced out of the directorship of OTA—saying recently that he doesn't recall Ted Kennedy "stifling or interfering" with the agency's work. But what mattered most at the time was the *perception*. The agency had always had critics; now the Kennedy controversy seemed to confirm their worst fears.

The fact that the young agency survived this moment of existential crisis is due largely to the man brought in to replace Daddario. Russell Wilbur Peterson was a former Republican governor of Delaware, with a background in science (he had a Ph.D. in physical chemistry), some industry experience (he had worked at DuPont), and an environmental record (he had been on the Council on Environmental Quality during the Nixon administration).

Peterson understood that the agency's integrity was compromised by the governing board's ability to stack OTA's staff with friendly aides. Before he agreed to take the job, Peterson recounted, he was warned by the heads of the prestigious National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine: "Don't take that job unless you have the ability to hire and fire." So once he was sworn in, Peterson set about unraveling the OTA patronage system. Only two members of the Technology Assessment Board objected, one powerful Senator from each party. One of the Senators privately threatened to cut OTA's budget in half if Peterson went forward with the staff separation; Peterson recalls responding, "Senator, I would rather have half the budget and a credible organization than twice the budget and no credibility." Peterson stood his ground, the patronage system was shut down, and OTA was left with an independent staff. Afterwards, the science administrators who had warned him about the patronage personally thanked him "for having brought some credibility to that office."

Years later, Peterson would switch to the Democratic Party, but even at the time of his appointment to OTA he was already "well known as a damn liberal," he recently told me. And his strong liberal political opinions may have interfered with his day-to-day running of the agency. Here is how the man who served as deputy director under Peterson later recounted the effects of his boss's beliefs: "Many of us shared his concerns for the environment, but it is very difficult to run the Office of Technology Assessment if one is so strongly biased that advocacy overwhelms objective analysis. He was an avowed environmentalist and would not brook opposition or interference from any quarter."

His ideological commitments notwithstanding, however, Peterson made OTA both more professional and more ambitious. Hoping to bring some long-term planning to the agency, Peterson and his staff drew up a new list of priorities, based in part on advice solicited from more than 5,000 outsiders. This priority list called for reports on water supply, food supply, disease-preventing technologies, educational technology, and much more—the sort of huge, forward-looking inquiries that the agency had been intended to conduct, but which hadn't yet happened because the agency was working in-the-moment, responding to short-term congressional requests. OTA's advisory committee was "really ecstatic" about the list, Peterson told me, but one member of the governing board—Utah Republican Senator Orrin Hatch, a devout Mormon—was upset that the priority list called for a study of population growth and specifically

discussed contraception. As Peterson recalls it, Hatch went "off the deep end," traducing Peterson with spurious claims about ethics lapses and extravagant waste at OTA. To "remove this source of antagonism," Peterson resigned from OTA in early 1979 and assumed the presidency of the Audubon Society, a position he had long coveted.

All told, Peterson directed OTA for less than a year and a half, but the critical reforms he put in place gave the agency badly needed independence. His successor—John Howard "Jack" Gibbons, a former experimental physicist who had spent the early 1970s working on energy and environmental issues in and out of government—quickly moved to shore up Peterson's accomplishments and to put OTA on a firmer footing. During Gibbons's tenure, the agency entered what has been called its Golden Age, during which its credibility rose and its work improved.

The Work of OTA

The core work of OTA was researching and writing thick reports—or "assessments"—for Congress. The agency's personnel did many other things as well, including testifying before Congress, commenting on drafts of legislation, and providing behind-the-scenes advice to congressional staffers. But the heart of OTA was its reports. In its maturity, OTA published between twenty and thirty reports every year, and had about that many research projects going on at one time, with each project costing around half a million dollars.

By the time the OTA was shut down in 1995, it had published a few hundred book-length assessments. If you include its other major studies and memoranda, OTA put out more than 700 publications in just over two decades of existence. Yet more impressive than the *size* of OTA's work-product is its *scope*; the breadth of the subjects the agency tackled is astounding. OTA wrote about gasohol and coal slurry and oil shale and nuclear power. It published on medical technologies from MRI to contact lenses to wheelchairs to prosthetics, on the oceans and outer space, and on high-tech tools for fighting crime and terrorism. There were reports on passive smoking, uses for wood, new satellite (and anti-satellite) technologies, artificial insemination, missile basing, municipal waste, and intellectual property in the information age. In a single month, the agency published reports on Russian nuclear proliferation, hip fractures in people over fifty, drug abuse, the use of virtual reality for combat training, and several other subjects.

As a rule, the agency didn't pick these topics for itself: they were selected by members of Congress. On rare occasions, commands for OTA

studies were written into legislation, but for the most part they were requested by committee chairmen. While OTA personnel would sometimes plant suggestions for studies in informal conversations with congressional staffers, each *formal* request for a study came from a chairman acting either from his own interests or on behalf of his committee; to prevent requests from becoming too partisan, OTA required the assent of the highest-ranking minority member of that committee. Usually, the agency would seek input from the leaders of other committees with jurisdiction over the subject to be studied, so that powerful members of Congress with turf to protect wouldn't feel blindsided. The agency also performed regular surveys of all the congressional committees, trying to stay ahead of the curve by anticipating their future wishes. Before work could begin on any study, the request had to be approved by the twelve-member bipartisan Technology Assessment Board, which could also make its own requests of OTA. In the end, the agency's agenda was controlled by a small number of each party's top members of Congress.

The research and writing was mostly done by the agency's staff, working in small teams. Back in the 1970s, many of the reports were written by contractors—in fact, the agency "was sold to the Congress from start to finish, House and Senate, as a *contract* operation … [with a] small but highly capable in-house staff," wrote one member of Congress in 1976. But that emphasis shifted as OTA matured. While hired guns still wrote a number of the reports, most of the work was eventually done by the agency's own professionals, which meant that many OTA staffers became widely acknowledged as experts in their fields. Overall, the agency employed between 140 and 200 people at any one time, often trained in more than one discipline. According to a 1989 *Washington Monthly* article, the staff included "a former English professor…, a guy with degrees in religious studies and forestry, a computer whiz with advanced degrees in forestry and soil science who's also a lawyer and one of the world's leading oceanographers, and a registered nurse with a Ph.D. in philosophy." People without cross-disciplinary training weren't always well suited to work at the agency. One former OTA staffer told me that new hires with a science-only background would frequently stay at the agency for just a few months before quitting: the work was too "ambiguous" for them, she said, and they often couldn't handle the "messiness of policy." At the same time, according to OTA director Gibbons in a 1989 interview, an individual trained only in public policy usually didn't "relate well to us" either.

This cross-disciplinary background allowed OTA's staffers not only to understand their areas of expertise, but also to understand the needs of their congressional masters. Because the agency was closely controlled by Congress, it rarely engaged in the sort of far-off speculation envisioned by the academic theorists who wrote about technology assessment. Instead, OTA's work was part science advising and part policy analysis, always aiming to be useful to legislators. There was never a formal formula for how OTA would do its work, no rigid methodology—only a very general outline of a process that was usually followed. As practiced by the agency, the term "technology assessment" came to mean simply, "Whatever OTA is doing now."

Some OTA reports would single out a specific technology for evaluation. In 1983, for example, a congressional committee asked OTA to look into the polygraph: the "nature and application of polygraph tests, scientific controversy over polygraph testing, data from field and simulation studies, and factors that affect test validity." The OTA investigation involved no original research, but was instead a thorough assessment of all the available scientific literature on the technology. The agency found that there was no scientific validity for using polygraphs for personnel security screening; that "the cumulative research evidence suggests that when used in criminal investigations, the polygraph test detects deception better than chance, but with error rates that could be considered significant"; and that "the basic theory of polygraph testing is only partially developed and researched." Based in no small part on these findings, Congress in 1988 passed the Employee Polygraph Protection Act, which put strict limits on the use of polygraphs by employers. The OTA report was considered, until very recently, to be the definitive look at the polygraph; it has even been cited, like several other OTA reports, by the Supreme Court.

Other OTA reports didn't look at a technology *qua* technology at all. For example, the 1993 study "Pharmaceutical R&D: Costs, Risks, and Rewards" scrutinized the finances of the drug industry. The impetus for the study was rising drug prices, which had by that time "been a concern of congressional committees for more than 30 years." The subject was (and remains) a contentious one, especially since billions of federal dollars are invested every year in research used by drug companies. Critics called the drug companies "profiteers" for exploiting government investment; supporters pointed to the costs and risks the companies faced in bringing a drug to market. The OTA advisory panel for this study brought

together economists, activists, drug company officials, liberals, and conservatives. The final report was a long and thorough analysis of the pharmaceutical industry. It didn't come down on either side, but acknowledged the difficulty of the subject while shedding light on hitherto unknown facts about the drug industry and its relationship with both the federal government and the insurance industry. Among the report's important findings was that the "National Institutes of Health and other Public Health Service laboratories have no mechanism to protect the public's investment in drug discovery, development, and evaluation." The study has been regarded as a landmark, cited widely since its publication.

Other OTA reports analyzed specific government programs—both in existence and proposed—weighing their merits and looking for inefficiencies. A 1994 report, for instance, examined the Social Security Administration's plans to replace its mainframe computers with more than $1 billion of new computer and network equipment phased in over five years. Several potential problems with the plan had been noted by another congressional agency, the General Accounting Office, and OTA was asked to make its own judgments. The OTA report concluded that the upgrade was sound, but that not enough thought had gone into how the computers would be used: "a tighter connection needs to be made between the technology and the expected improvements in service delivery." Working from options OTA presented, Congress saved several hundred million dollars.

Of course, not all OTA reports were definitive studies or influential in shaping legislation; many were forgettable documents written on topics only of passing interest to Congress. And they were not all uniformly cold and impersonal technocratic analyses; studies on subjects like drug abuse and infertility would often cast the problems in human terms, using anecdotes and pictures. For example, two pages in a report on finding help for people with Alzheimer's disease describe a month in the life of a family with a newly afflicted mother. The family's learning process—picking up the terminology, figuring out the available care-giving options, researching what Medicaid would cover, getting the runaround from government agencies and daycare centers—is played out against the backdrop of the mother's ailment. Their ordeal illustrates the countless confusions and nuisances and burdens that a coping family faces—human details that a government bureaucrat might not think about. This was OTA at its best: both careful and humane, confronting the policy dilemmas of advanced technological society without forgetting the experiences of everyday life that always matter most.

Political Neutrality and Policy Relevance

The two most striking features of OTA's style of work were the agency's reliance upon outside expertise and its method of trying to remain "neutral." The agency naturally availed itself of the advice of experts within the executive branch, but it also brought in large numbers of knowledgeable people from outside of government. OTA relied heavily on input from advisory panels, critical reviewers, and private stakeholders from multiple sides of each issue; it hosted meetings and workshops; it hired contractors and formed task forces; it sought advice in site surveys and studies out in the field. This was a tremendous force-multiplier: OTA's staff of less than 200 would bring in perhaps 2,000 external experts each year. It helped, of course, that the agency had the power of Congress behind it—and even the power of subpoena, which it apparently never exercised—but many of these outside experts were just glad to be useful. This willingness to help OTA grew along with the agency's stature, so that even the wealthy and influential would make themselves available. "If it were anybody else, we wouldn't give you the time of day," one former agency staffer recalls being told by European corporate leaders. "But OTA is different."

The agency's inclusiveness, its solicitude toward the divergent perspectives of many different stakeholders, fit with its avowed mission of neutrality. OTA's reports didn't give Congress an authoritative "consensus" recommendation. Instead, OTA's reports sought to be complete and fair, and offered a menu of policy *options*. This approach wasn't appreciated by everyone—"We need clear strategic advice" instead of "a list of policy options," a leading congressman once complained to the *New York Times*—but it was the only way OTA could stay in the good graces of its bipartisan overseers, and the only way to remain credible in the eyes of outsiders who disagreed with one another. The agency thus managed to turn one of the classic vices of expert advice into a virtue. Political leaders have always complained about wishy-washy experts. Annoyed by timorous advisors whose economic recommendations were always qualified with "on the other hand," President Truman famously wished for a one-handed economist. For the same reason, Senator Edmund Muskie joked about wanting a one-armed scientist. Yet by offering reports with a range of policy options, OTA tried to keep itself neutral and let the policymakers duke it out with one another instead of the experts.

Neutrality, however, is in the eye of the beholder, and a few of OTA's reports over the years raised questions about the agency's fairness. A series of reports on industrial policy made Republicans complain, reports

on deregulation made Democrats balk, and other reports caused minor controversies from time to time. In 1990, the agency's investigation of alternative cancer treatments even brought protestors to the OTA offices. As Gibbons explained, it was one of those rare issues "where people don't understand the science but are passionately concerned about it."

But none of these controversies was remotely as contentious as OTA's reports on President Reagan's proposed Strategic Defense Initiative (SDI). The first agency response came out in April 1984, just over a year after Reagan announced the initiative. It wasn't an official OTA "assessment," but a background paper written by a physicist working under contract with the agency. It lacked the usual OTA advisory panels and stakeholder input, and consisted entirely of this contractor's analysis of the technical feasibility of using space-based lasers and other "directed-energy weapons" to shoot down missiles heading toward the United States. The paper concluded that the chance of a ballistic missile defense working as advertised "is so remote that it should not serve as the basis of public expectation or national policy." The Pentagon and the White House objected strenuously to the paper's findings and the press had a field day covering the dispute. The next year, OTA published a more characteristic report on SDI—but even though this second report was more balanced, more thorough, and more equivocal in its findings, it still offered little hope to supporters of missile defense and left Republicans with a bad taste in their mouths. Finally, in 1988, a mammoth third report—the complete, classified version had about 900 pages—was so pessimistic about missile defense that it concluded that *at best* only "a modest fraction" of incoming Soviet missiles could be destroyed. This again caused an uproar, and gave Democrats in Congress ammunition to scale back the program. Many Republicans resented OTA for its position on missile defense—a resentment that would later come back to haunt the agency.

Of course, the vast majority of OTA's reports were much less controversial and stayed largely under the radar of the press and the public. Most OTA reports were just a low-key part of the policy process, serving to distill reliable facts, clarify debates, and improve congressional understanding. The agency "did not swing votes or change public opinion in a visible way, but typically labored in comparatively obscure fields—helping committees frame issues and construct the policy agenda," wrote Bruce Bimber. In surveys, most congressional staffers said they thought OTA's reports were useful, but it is impossible to know how many of OTA's long reports were ever actually read on hectic Capitol Hill. To make its

findings more accessible, the agency frequently provided face-to-face briefings, and the executive summaries of its reports were usually available as short, separate publications. The agency went a step further for members of Congress, providing them with ultra-abridged one-page "summaries of summaries." But even those weren't sufficiently succinct for time-starved legislators. One OTA staffer told me about a Representative who asked whether the one-page summaries could be made double-spaced. On another occasion, OTA director Gibbons recalled being asked by a Senator whether the summaries could be condensed to fit onto an index card. He replied, "Well, only with very fine print."

It is not easy to trace the effects of OTA's work on specific legislation. A few OTA reports—on subjects like polygraph testing, worker dislocation, the trucking industry, post-Cold War defense spending, and preventive interventions in healthcare—correlate directly with specific bills that became law. It is also possible to show direct links between a few OTA reports and bills that were proposed but didn't ultimately become law. At the same time, part of the difficulty in gauging OTA's legislative impact is that the agency sometimes convinced Congress to kill bills or do nothing at all. "Sometimes, inaction [was] a salutary effect" of OTA's work, one former staffer explained.

OTA's reports were also useful to the wider policy community beyond Congress, and there was even a considerable international audience for the agency's writings. (Foreign governments would reportedly translate some OTA studies as soon they were published.) Many of the agency's reports were bland and dry and dull; most were perspicuous, some were quite eloquent. A large number of OTA's reports have "gone stale" over time, as one former staffer put it; they are interesting now simply for their historical value. But a remarkably large amount of the agency's work is still relevant today—or in some cases, *more* relevant today than when it was written. Reports on the drug industry, the effects of nuclear weapons, the privacy of medical records, adding taggants to explosives, and automobile efficiency still get cited. OTA reports on aging and dementia—like the 1987 report *Losing a Million Minds*—are still regularly referred to. A review of publications from just 2004 in the LexisNexis database brings up references to these and many other OTA reports, including reports on educational technology, nurse practitioners, AIDS, adult literacy, healthcare in rural areas, and high-tech challenges to copyright.

Perhaps the OTA reports that remain most relevant today are two on "technology against terrorism" from 1991 and 1992, and two others from

1993 about weapons of mass destruction—one on proliferation, the other on the specific technologies involved. Both WMD reports have received numerous references in the past few years, and they are sometimes used as primers in college courses. They have also achieved a new currency on Capitol Hill, according to Henry Kelly, a former OTA staffer who now heads the liberal Federation of American Scientists. "When Congress was under attack from anthrax shortly after 9/11, members scrounged up" the old WMD reports, looking for guidance wherever they could find it.

But as impressed as we might be today by OTA's record—its general reputation for fairness, its effect on improving the work of Congress, and the prescience and long shelf life of some of its reports—the agency had many critics. And when the political winds shifted on Capitol Hill, OTA was doomed.

The Fall of OTA

When Bill Clinton entered the White House in January 1993, he picked OTA director Jack Gibbons to serve as his science advisor. Gibbons was replaced at OTA by Dr. Roger C. Herdman, a physician who had left the Sloan-Kettering Cancer Center nine years earlier to lead OTA's health and life sciences division.

Although Herdman didn't intend to make big alterations to OTA's processes and practices, he quickly learned that he'd have to make some management changes. "We were made aware during the director selection process—in conversations with members of the board—that there were increasingly going to be financial pressures on the agency, and we would need to be more efficient and produce reports in a more timely way," he told me. In response, Herdman made several moves to streamline the agency, reorganize its programs, and cut the number of managers.

The belt tightening was just one palpable indication of deeper shifts. In the 1992 elections, anti-incumbent sentiments led to an extremely high turnover in Congress. Although the Democrats still controlled both houses of Congress, the Republicans' unusually large freshman class emerged as a powerful and aggressive conservative bloc. In 1993, a handful of these conservatives sought to terminate all funding for OTA. While these efforts didn't go far, they were clear signals of changing times for the agency.

The 1994 election brought the Republican Revolution and GOP control of Congress for the first time in four decades. The reform agenda that helped Republicans take the House of Representatives—Newt Gingrich's Contract with America—included pledges to cut congressional spending,

and the new governing party quickly reduced funding for committee staffs. In the Senate, Republicans moved quickly to make cuts to the congressional support agencies—including the total elimination of OTA.

In dollar terms, doing away with OTA wouldn't save Congress much money. It was by far the smallest congressional agency, costing roughly $20 million per year—one percent of the total congressional budget and an unnoticeable mote in the total federal budget of $1.5 trillion. But getting rid of OTA would boost the Republicans' budget-cutting credibility by showing they were serious enough to sacrifice an entire agency.

Saving money wasn't the only reason the Republican leadership put forward for abolishing OTA. Some critics argued that the agency was superfluous. "The problem is that they are redundant and irrelevant to the decisions that members have to make," one Senate staffer told *Science* magazine. They simply put out "duplicative reports." But in fact, none of the other agencies' work overlapped significantly with OTA's, and no other organization—in or out of Congress—duplicated in one place its breadth of analysis on policy issues related to science and technology.

Another rationale for eliminating OTA was that the agency was too slow. Typically, OTA reports would take 18 to 24 months to complete—an eternity in the fast-paced Capitol. House Science Committee chairman Robert Walker later put it quite nicely, saying that the agency had no feel for the "legislative rhythm." OTA's reports "took far too long to produce, and as a result, were not timely enough for a body which is often forced to address problems with little lead time." This is a valid complaint, but OTA alumni respond that the subjects the agency covered often weren't time-sensitive; OTA tended to work on "termites in the basement problems" instead of "wolf at the door problems," former OTA staffer Julie Gorte recently told me. Indeed, since the agency dealt with long-term issues that would come before Congress time and again, some of its reports might even be considered years *early*.

Perhaps the most peculiar argument for shutting down OTA was the claim that the agency was an "unnecessary middleman" between legislators and experts. This argument seems to have originated with former Speaker Newt Gingrich, who has said that members of Congress should get the information they need by interacting directly with scientists. As a Gingrich spokesman told a UPI reporter in 2004, "Why would you put a filter between you and a scientist?" There is a certain charm to the image of congressmen calling researchers to consult on questions of cutting-edge science, and there is no question that some members and committees

sometimes do so. It also makes sense that the notion would come from Gingrich, who really does engage the scientific community, and who prophesies about the disappearance of middlemen in the present "age of transitions." But it is overly simplistic to think of OTA simply as an extraneous filter or an eliminable middleman. At its best, the agency was a journalist, translator, and fact-checker all rolled into one.

First, in its role as a *journalist*, OTA attempted to sort through massive amounts of information from many different sources. It is insufficient for a legislator to seek direct advice from one or two experts on pressing science and technology questions; they are usually disputed questions that require a whole range of opinions, and interdisciplinary questions that no one person has a handle on. Second, in its role as a *translator*, OTA sought to bridge the gap between the language of science and the language of policy. Technical terms and ideas need explanation, and scientists usually aren't the best explainers. OTA made the two languages understandable to both camps. Finally, in its role as a *fact-checker*, OTA attempted to screen out the quacks and the snake-oil peddlers, sort through the spin, and temper the enthusiasm of excitable members of Congress caught up in scientific fads. Without a trusted fact-checker interposing between the policymaker and the technical advisor, the policymaker often has no basis by which to judge the quality of the advice he gets. Of course, OTA's success in these crucial functions depended on its objectivity, and in some cases depended on overcoming certain ideological biases that predominated on the OTA staff. Whether the agency achieved such objectivity is a point many conservatives dispute, often with an ideological zeal of their own.

Indeed, many Republicans were still bitter about OTA's reports on missile defense from the 1980s, and a few with long memories recalled the agency's identity crisis of the 1970s, when it looked like Ted Kennedy was making OTA into his plaything. Although they only rarely admitted it publicly, many leading Republican members of Congress and staffers believed that OTA was just too liberal to keep paying for. They believed the agency used the mantle of "scientific objectivity" and "policy neutrality" to undermine conservative policy ideas and promote liberal ones.

In the end, OTA was an easy political target. Most rank and file members of Congress felt no direct connection to the agency; since OTA worked largely with committee chairmen, it had no dedicated constituency among the junior members—and the very large freshman class was practically unaware of OTA's existence. Only a few supporters from both parties, including members of OTA's governing board, went to bat for the agency. There

were a few desperate attempts to keep OTA alive, including a last-ditch proposal to fold it into one of the other congressional support agencies. But these exertions came to nothing, and OTA's funding was reduced to zero.

The agency was officially shuttered on September 29, 1995, the last day of the fiscal year, bringing to a close the two-decade-long experiment in congressional science and technology advice. One staffer summed up the agency's story like this: "Imagine a political organization creating within its own midst a body of independent-minded, extremely bright and well trained thinkers and allowing them, almost always, to tell the truth.… It's a little hard to assume such an organization could exist for long or even at all." But not everyone believed that OTA achieved this Platonic ideal of objectivity, and not everyone was convinced that it is even achievable.

An Advice Deficit?

If the Republicans in Congress expected to get any positive press from eliminating OTA, they were disappointed. As Bruce Bimber points out, "Legislators lost control of the 'Cutting Congress First' message in the media, which tended to portray the elimination of OTA as either an act of short-sightedness or simply the ending of a congressional perk—akin to free ice-deliveries and subsidized haircuts." Meanwhile, members of Congress who had supported the agency portrayed the shutdown as a colossal mistake. Senator Kennedy and Representative Amo Houghton, a Republican who had fought to keep OTA open, signed a joint letter comparing OTA's elimination to the "disastrous" decision of some European monarchs not to fund the first expedition of Columbus. The late Representative George Brown, former Democratic chairman of the Science Committee, lamented the loss of Congress's "defense against the dumb." One Democratic Senator compared it to a "person deciding they were going to go on a diet and concluding that the way to start was to eliminate their brain." (The lobotomy metaphor has appeared quite frequently in the public discussion about OTA's closure.)

Since OTA was terminated, members of Congress have had to rely on other sources of information for their science and technology advice, sources that long existed alongside OTA rather instead of it. Many legislators seek advice through informal channels and connections, as was the case for Senator Hatch in 2001 when he was seeking to understand embryonic stem cell research. According to *Congressional Quarterly*, the largely pro-life Senator decided to support embryo-destroying research based "on the advice of a University of Utah pediatrician he knows and

trusts and a cancer researcher at the same institution whom he regularly consults."

Members of Congress also turn to their scientifically trained peers for advice. A recent study in the *Journal of the American Medical Association* found that about one percent of all members of Congress since 1960 have been doctors; in the first century of the republic, it was almost five percent. An even smaller number have a background in science or engineering. These members are naturally consulted by their colleagues. For instance, Representative Vernon Ehlers, a Michigan Republican, is a former research physicist, whose encounter giving a science lesson to a fellow congressman was hilariously reported in a 2001 *Washington Monthly* article:

> Before a recent budget hearing on the National Science Foundation … Rep. Vernon Ehlers happened to bump into a Republican colleague. He informed Ehlers of his intent to whack the appropriation, grumbling, "NSF has no business funding automatic teller machines and gambling." Fortunately, Ehlers, whose doctorate in physics comes from University of California at Berkeley, quickly set him straight, explaining "ATMs and gaming theory" actually referred to Asynchronous Transfer Mode, a coding scheme in communications, and to mathematical approaches to probabilistic analysis. Those two hot research areas were more in tune with NSF's mission, but without intervention from Ehlers, his colleague would have put them out.

That incident is one that the existence of OTA probably wouldn't have prevented, but it does demonstrate how legislators with scientific training are increasingly called upon as informal authorities on science and technology issues. When asked whether House Speaker J. Dennis Hastert would consider re-establishing OTA, his spokesman replied: "The Speaker … views members like [House Science Committee Chairman Sherwood] Boehlert and Vern Ehlers as a clearinghouse for what science says. They're leaders in that area." The problem is that Boehlert and Ehlers are apparently unconvinced they can effectively serve as a "clearinghouse for what science says," since they both have *supported* bills to bring back OTA.

Another source of science and technology information for all members of Congress is their staffs. In the House of Representatives, members usually have one staffer whose crowded portfolio includes science and technology. Senate offices, with their bigger staffs, sometimes have one staffer (or in rare cases, two) whose main concentration is science and technology policy. And congressional staffs are sometimes supplemented by experts-on-loan: The Congressional Science and Engineering

Fellowship Program brings about three dozen scientists and engineers to the Capitol every year to work in the offices of members and committees. But these fellows, like other harried congressional staffers, rarely have the time to investigate technical matters in depth, and their transience makes long-term analysis almost impossible.

Various committees—like the House Committee on Science and the Senate Subcommittee on Science, Technology, and Space—hold fascinating and timely hearings featuring many renowned experts, and the committee staffers do yeoman's work on a great deal of complex legislation. But the witnesses who testify don't represent every view, and the staffers rarely have sufficient time or breadth of expertise to analyze these complex matters fully and carefully. Congress also gets valuable advice from scientists and technical experts who work for executive branch agencies—but insofar as it is the duty of the legislature to fund and oversee those agencies, Congress often needs more disinterested advice.

Washington's many think tanks and advocacy groups also provide Congress with a great deal of expertise on technical matters, but it comes with vastly varying degrees of reliability. Some of these organizations employ renowned scholars who offer careful analysis of complicated science policy questions; they testify on Capitol Hill, churn out articles and reports and books, lecture widely, and sometimes appear as experts on television news. Other organizations employ nameless policy warriors who happily fight in the partisan trenches; they seem to stake out policy positions first, then fit the evidence to their own favorite assumptions later. Because these organizations tend to divide along the same ideological lines as the political parties, they give many policy debates the distinctive feel of "you-have-your-experts, we-have-ours." (The debates on climate policy and obesity come readily to mind.)

The most trusted source of scientific advice in America is the National Academies complex—comprising the National Academy of Sciences, the National Academy of Engineering, the Institute of Medicine, and the National Research Council. The latter organizes "blue ribbon" panels that produce roughly one or two dozen studies for Congress each year, many of them acknowledged as the definitive statements of scientific matters. Since OTA was shut down, the National Academies have hired many OTA alumni—about fifty by one count—and the Academies have taken on more studies for Congress than when OTA was still in existence.

But as science and technology advice for Congress, the National Academies reports leave much to be desired. Studies from the Academies

are written by eminent scientists without significant input from the public or stakeholders who might be affected by their conclusions. The study committees are usually required to reach a consensus position and make specific recommendations. This means, according to former OTA director Herdman, who now works at the Academies, that the panels are sometimes intentionally designed so that "there not be people who might have conflicting views." This *modus operandi* is the opposite of OTA's in nearly every way: OTA studies were written by policy analysts who expected conflicting perspectives; they didn't have to reach a consensus, and they were free to give an array of options instead of an authoritative recommendation. Unlike many scientific questions where objectivity is the ultimate goal, most policy questions involve choosing among different options, each with their own trade-offs.

In addition, studies from the Academies are often too slow. Even though OTA was often criticized for taking as long as two years to complete its reports, the Academies regularly take longer. In some cases it has taken two years for the Academies to *begin* real work on a study. (One long-ago study on the Alaskan wilderness reportedly took twelve years to complete.) In fairness, several recent reports from the Academies have come out quite quickly, and measures are planned to improve things even further. But in the main, reports from the Academies are much less timely than OTA's were.

Finally, Congress is not the Academies' only master. The Academies do five times as many studies for executive agencies as they do for Congress. Even when Congress orders a study, the funding doesn't come directly from the legislature; it is usually funneled through an executive agency—one which might be opposed to the study and hold up the funding. And because the Academies are detached from Congress, they cannot really give ongoing legislative advice on the subjects of their reports. OTA staffers, by contrast, offered members of Congress preliminary reports on large projects in progress, and could serve as a source of in-house expertise after their completion.

Congress does have other sources of in-house expertise in its three remaining support agencies. The youngest of these agencies, the Congressional Budget Office (created in 1974, two years after OTA) performs economic analysis and has a negligible capacity for science and technology advice. The oldest agency, the Congressional Research Service (CRS, founded in 1914 under a different name) is an information and analysis service operated by the Library of Congress. Its astonishingly produc-

tive and prolific staff fields half a million questions from members of Congress every year on every conceivable subject—from the most mundane to the truly arcane—with lightning speed. CRS's Resources, Science, and Industry Division writes impressive reports on nearly every aspect of science and technology policy. Although it has been suggested that CRS might feasibly become a new home for the sort of technology assessments that OTA used to produce, that seems unlikely for several reasons. First, CRS emphasizes fact-gathering and reporting, not thorough analyses with input from diverse stakeholders. Second, since CRS only exists to serve Congress, its reports aren't officially published—which means, as Brookings Institution scholar Michael Levi recently noted in *The New Republic*, that CRS reports don't "help build a common foundation of public knowledge upon which legislation can be judged." And finally, the breakneck pace at CRS makes OTA's kind of slow, deliberate analysis all but impossible. As one CRS employee who did a stint at OTA pointed out to me, OTA studies usually took more than a year and a half to complete, while "at CRS, anything that takes two weeks or so used to be called a 'major project.' Our time at CRS is far more fragmented than at OTA."

The third remaining congressional analytical agency is the Government Accountability Office (GAO, established 1921). Until 2004, it was known as the General Accounting Office, and the name change reflects its changing mission from an agency that started out checking the government's books to one that does much deeper investigations and evaluations of government programs. At first glance, the watchdog GAO might seem an unlikely source for serious science and technology advice. After all, as OTA veteran Christopher T. Hill writes in the 2003 book *Science and Technology Advice for Congress*, "the bulk of GAO's work is retrospective… the fundamental ethos of the agency is that of the accounting and auditing professions—GAO looks back, carefully." But in the past few years, legislators who miss OTA have managed to wangle a small sum of money into GAO's budget so the agency could perform two OTA-style technology assessments. The first of these assessments (on the use of biometrics in border security, published in November 2002) was an impressive effort, although an external review suggested that it was only minimally useful for Congress, perhaps because GAO has "relatively little previous experience in framing and performing policy analysis." The second report (on cybersecurity, published in May 2004) did a thorough job of outlining and explaining many of the current problems of cybersecurity, but the analysis and recommendations were again rather thin.

Nevertheless, the partial success of this GAO pilot program led to an attempt in 2004 to give GAO a permanent "Center for Science and Technology Assessment"—essentially reincarnating OTA. That effort was led by Representative Rush Holt, a patent-holding, *Jeopardy!*-winning, anti-war liberal Democrat from New Jersey whose supporters have bumper stickers that say "My Congressman *is* a Rocket Scientist." (Not quite true—although he *is* a research physicist.) Holt has spearheaded efforts to resurrect OTA since he came to Congress in 1999, and has had some notable achievements, like getting 87 cosponsors (almost all Democrats) for a 2001 bill to restore funding to the agency. (Since Congress never repealed the Technology Assessment Act, the agency still exists in a legal sense; it simply has had no money appropriated to it.) So far, all of Holt's efforts have failed, including the 2004 plan to tuck an OTA clone inside GAO.

But Rep. Holt will surely try again, encouraged in his strivings by a small band of science policy wonks that strongly wish to see him succeed. At the core of this group of true believers is a large contingent of OTA alumni. In the aftermath of the agency's demise, some of them established a short-lived "Institute for Technology Assessment" intended to take OTA's mission to the private sector. Some of them assemble each year for "xOTA" picnics, and many of them track the progress of OTA-resurrection efforts on the "xOTA" e-mail list. These former staffers are largely nostalgic about OTA and bitter about its demise.

Some of these alumni participated in a large workshop in Washington in 2001 that evolved into the aforementioned book *Science and Technology Advice for Congress*. That book weighs the advantages and disadvantages of several different institutional arrangements for improving the way Congress gets its technical expertise, drawing lessons from OTA's history and from the experiences of the numerous European technology assessment agencies modeled after OTA. The authors work their way through many of the same questions Emilio Daddario grappled with more than three decades ago: Should the advice come from an agency inside Congress? Should it use its own staffers or rely on outside contractors? Should it address immediate policy concerns or conduct long-term analyses?

Many ideas for reform recur over and over again: First, a new OTA-like institution would have to be *faster and more responsive* than OTA was. (Thanks to the Internet, it would be bound to be faster anyway.) Second, it would have to be more lithe and lissome, coming up with *smaller products than just book-length reports*, while still undertaking the long-term

studies that made OTA uniquely valuable. Third, it would have to *relate differently to Congress*—perhaps taking requests from junior members. (This would not only help serve the agency's mission, but would give the agency a broader constituency of support than OTA enjoyed.) And finally, it would probably need *a new name*; not only does the name "Office of Technology Assessment" conjure up bad memories for some members of Congress, but it also fails to signify the full role that the agency would play.

The big question is whether such a body will ever be re-created, and whether it should be. Most Republicans say no on both counts.

The Conservative View

Congressional Republicans are opposed to re-creating OTA for three basic reasons: cost, pride, and concerns about bias. Worries about cost are simply unconvincing given the small expense of such an agency compared to the overall budget. Pride, meanwhile, stands in the way of elected officials admitting mistakes and seeing things clearly. While most of the Republican leaders responsible for OTA's abolishment are gone, a few members who fought hard against OTA are still around and don't desire a public reversal.

But the most significant reason for Republican opposition is the belief that OTA was a biased organization, and that its whole approach was misguided: a way of giving a supposedly scientific rationale for liberal policy ideas and prejudices. This concern needs to be understood on its terms, and the OTA record seen *through Republican eyes*:

- The agency was created by a Democratic member of Congress who served as its first director.
- Its greatest patron in its early years was liberal icon Edward Kennedy, who tried hard to stack OTA's staff with his favorites. He was there when OTA was created, he was there when it was dismantled, and he was right there the whole time in between.
- The agency's second director, Russell Peterson, was a Republican—but so liberal that he switched to the Democratic Party in 1996, donated to the campaigns of Al Gore and John Kerry, and in 2003 published a vituperative and resentful tract (*Patriots, Stand Up!*) accusing "far right-wing Republicans" of "using evil tactics and strategies to transform America" and launching "a full-scale attack on the way of life Americans have created over many decades."
- The third director of OTA is described as follows in science writer Daniel S. Greenberg's 2001 book *Science, Money, and Politics*: "The direc-

tor of OTA was John Gibbons, a physicist, ardent environmentalist, and confrere of Al Gore during Gore's ascent from congressman to Senator to Vice President; both came from a Tennessee background. For fourteen years, Gibbons served as an apolitical servant of Congress in the nonpartisan OTA directorship. In 1992, President-elect Bill Clinton named Gibbons to the government's top science post, assistant to the president for science and technology. When Gibbons moved to the White House job, he took several senior OTA staff members with him, reinforcing the not-unreasonable impression of political affinity between OTA and the Democratic side of politics." Gibbons, for his part, takes strong exception to Greenberg's portrayal, saying that it is "totally indefensible." But what matters for our present purposes is the *perception* of liberalism. Incidentally, as a private citizen, Gibbons would go on to make campaign donations to Al Gore and Hillary Clinton.

• In the 1980s, many Republicans became convinced that OTA's reports on SDI were little more than a partisan hatchet job. Greenberg notes that "while the OTA missile-defense study was in progress, General Daniel Graham, a Star Wars supporter, resigned from the OTA advisory committee, accusing the OTA director [Gibbons] of press leaks 'to advance your personal point of view.'"

• Although OTA was officially nonpartisan and its new hires were not asked their political affiliations, most of the agency's personnel were fairly liberal. A few of the former OTA staffers I spoke with candidly admitted that the agency's offices were "filled with mostly liberal-leaning people," and were "80 to 90 percent Democratic."

• Generally speaking, OTA's reports favored "federal intervention over market-driven and state-level solutions," as one former staffer noted four years ago in *Issues in Science and Technology*. "Subtle pro-government and left-of-center viewpoints" would maddeningly seep into many OTA reports, another staffer told me. If OTA analysts didn't like an idea, "they would find all the valid technical reasons it would be hard to do and find no evidence for the cultural, political, historical, economic, and sometimes technical reasons why it could or should be done."

• Look now at who is clamoring loudest for the return of OTA—the *liberal* Union of Concerned Scientists; Henry Kelly, president of the *liberal* Federation of American Scientists; Rush Holt, a *liberal* Democratic congressman; Chris Mooney, *liberal* science writer and gadfly; and so on.

The details of OTA's apparently left-leaning history powerfully persuade most congressional Republicans against bringing back the agency

or anything like it. But it is possible to make a conservative argument for restoring a body with OTA's mission. First, a fiscal conservative might reasonably argue that while OTA might cost a few tens of millions of dollars, it has the potential to save the country tens of *billions* of dollars by advising against wasteful projects, as OTA sometimes did.

Second, there is the original argument posed three decades ago, the argument that animated OTA in the beginning: that the legislative branch needs its own source of science and technology advice, independent of the enormous resources of the executive branch. On issue after issue, Congress simply follows the lead of the executive, without the vision or understanding of scientific issues to set the policy agenda. In closing OTA, the legislature lost a tremendous source of rigorous analysis, and thereby ceded some of its real power to the executive. And just as Congress has an agency to perform independent economic analysis because of the many economic issues that come before it, so should Congress have an agency for independent analysis of the many science and technology issues it faces.

Third, a moment's thought brings to mind a dozen or more subjects where an analytical agency like OTA could be of use today: Internet taxation, the role of technology in the off-shoring of jobs, the new Moon-Mars space initiative, restructuring America's rail system, music and movie piracy, preventing fraud in computerized voting, so-called "bunker-buster" nukes, the fluctuating vaccine industry, new airport security technologies, the scale and scope of the National Nanotechnology Initiative, and a whole host of questions related to biotechnology—cloning, chimeras, xenotransplantation, bioengineering, and so on. Each of these subjects is a matter of great moment for the federal government, yet one wonders how well prepared or well educated legislators and their staffs are on these issues. Congressional Republicans may not care much about the disparity in expertise between the executive and legislative branches at the present time, with their party controlling both the Capitol and the White House. But in the long run it must be redressed to preserve the balance of powers.

Finally, in recent times, science has become an incredibly powerful force, one that demands public support "without scrutiny or responsibility," as Greenberg puts it. The scientific and technological enterprise is astonishingly ungoverned and unaccountable in America, and it sometimes functions with total disregard of the public interest. Our government is derelict in allowing this, and restoring OTA might be a first small step toward a remedy, so long as it remains a center for

independent analysis of scientific issues, not an effort to reduce all policy questions to questions that scientific expertise alone can simply settle.

The Republican aversion to expert bureaucracies—the fear that a new agency will quickly fall into reflexive left-wing advocacy as so many old agencies have before it—is by no means unfounded. That has indeed been the pattern of the new departments, agencies, and bodies created by the federal government over the last several decades, perhaps including OTA. But there is a grave danger in this populist disparagement of expertise. When it comes to science and technology, most members of Congress, including many of those most deeply involved in the relevant policy fights, are dreadfully ignorant. They need serious and reliable advice and information, and the present structure of staff and support agencies is not sufficient to meet this need. To pretend that no such need exists is foolish; and to conclude, without trying, that a new advisory body would inevitably become an ideological nightmare is defeatist, and unworthy of a majority party that seeks to govern responsibly for years to come.

The story of OTA offers cautionary lessons for Republicans in Congress. But the story also offers an example of a serious attempt to inform the legislative process in a responsible way. Confronted with the challenges of governing on crucial but extremely complex scientific questions, the leaders of Congress in the 1970s made a serious effort to provide themselves with sober and reliable expertise. Today's congressional leadership, confronted with at least as great a challenge, should learn not only the negative lessons of the OTA experience, but also the positive, and should, in their own way, on their own terms, build their own version of a professional advisory body on science and technology.