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ON SCIENCE & PUBLIC POLICY

Science Advice to Congress

by

Michael Gough, Daniel S. Greenberg
and Richard E. Rowberg

GEORGE C. Marshall INSTITUTE

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May 22, 2006

Jeff Kueter: Good afternoon, everyone, and thank you for coming this afternoon for this latest installment of the Washington Roundtable on Science and Public Policy, which is a continuing series of the George Marshall Institute designed to bring scientists together with policymakers to discuss issues of the day. Earlier this year, the Institute launched a new project to begin to examine how Congress receives advice about science. This project is unique in the sense that we are looking at this question not from the lens of any particular area or topic, but rather our interest is in the generic modes and information processes, the tools and the organizations that Congress brings to bear to solicit scientific advice and that external groups, be they scientific societies, individuals, interest groups or other organizations, the tools and instruments that they use to provide input to members of Congress and their staffs.

Today's event is the second product of that new project, the first being the publication of *Scientific and Technical Advice to Congress*, a book by one of our speakers evaluating some of the models and suggestions that have been put forward in other fora to look at this problem and to improve the quality of advice to Congress. There are copies of this book available outside and I encourage you to pick one up if you haven't done so already. Today's panel is asked to address that generic question: how do members of Congress and their staffs receive information about scientific matters? I posed three questions to them:

- How do Members of Congress and their staff receive information about scientific matters that influence public policy?

- What are the advantages and disadvantages of those modes of information transmission?

- What options and alternatives are available to improve this situation and what are the limitations of those options?

We will begin the conversation there and I look forward to their comments and their perspectives. They all have long careers in the scientific and technical policy debates and they all bring very different perspectives to that question.

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[*] The views expressed by the authors are solely those of the authors and may not represent those of any institution with which they are affiliated.

Our first speaker is Richard Rowberg, the Associate Executive Director in the Division of Engineering and Physical Sciences of the National Research Council at the National Academies of Science and former Acting Executive Director for Communications in the Division of Engineering and Physical Sciences of the National Research Council of the National Academies. The second speaker will be Daniel Greenberg, a journalist specializing in science and health policy and the author of a book that I can't recommend more highly, *Science, Money, and Politics: Political Triumph and Ethical Erosion*. The final speaker is Michael Gough, the former Director of Science and Risk Studies at the Cato Institute and a former staff member of the Office of Technology Assessment and the chairman of advisory committees at the Department of Veterans Affairs and Department of Health and Human Services. Please join me in welcoming our speakers.

Richard Rowberg: Thank you. I think it's a pleasure to be here; not because of the audience, which I am very happy to be talking to, but, having been out of the loop of talking about the topic of science advice to Congress for several years, whether I have anything useful to say. Anyway, we will find out in the next fifteen minutes. One reason I am here, I guess, is that I have been spending a number of years trying to do this very thing. I spent eleven years at the Office of Technology Assessment (OTA) followed by 16 years at the Congressional Research Service (CRS). In addition, a great deal of my job at the Academies has been to facilitate the transfer of information from our studies to the Hill, so I suppose I have been doing this job for thirty-one years.

There is no question that science and technology have been a substantial part of almost all public policy issues for some time now. As a result of this fact, Congress has been involved with science and technology to a considerable extent for several decades. It has dealt with a range of public policy issues related to science and technology since the beginning of the republic, but in the years since World War II, this activity has mushroomed. In addressing this topic, I think it is important to recognize that science and technology and public policy intersect in two ways. Chris Hill, another former OTA/CRS staffer, put it very succinctly by noting that there is public policy for science and technology and science and technology for public policy. The former concerns such things as research and development, regulation, and related actions that directly affect the development and end points of science and technology. The latter intersection, I think, is more important and much more complex. Basically science and technology for policy asks about the role science and technology plays in broad public policy issues such as health care, education, environmental policy, national security, and so forth. We all know that S&T can be an important factor in those areas, but how it interacts with these issues and how it affects options for addressing them are, for the most part, the primary motivations for the need to provide science and technology advice to Congress.

When Congress first noticed, in the late 1950s and early 1960s, that it was going to be deluged with these kinds policy issues—primarily with the growth of concerns

about national security, the Soviet advances in S&T, the space program, environmental policy, and so forth—it decided that something needed to be done about upgrading the quality of analysis it received about S&T and policy. So Congress did a number of things. Two of the most important were the creation of the Office of Technology Assessment in 1972 and the upgrading of the Congressional Research Services' S&T analytical capability with the establishment of the Science Policy Research Division in 1968.

In addition, Congress has a wide array of ways in which information and advice can get to it; we all know that. These mechanisms, which I am going to spend some time talking about, are used for every conceivable policy issue, not just those about science and technology. When the need for more S&T advice became apparent, these mechanisms did need some modifications which usually took place in a fairly ad-hoc way as we shall see. Unlike actions to form OTA and upgrade CRS, however, there was no systematic assessment of the capability of these other paths for delivering S&T advice, and their processes continue to be largely non-structured.

In the course of the growth of providing science advice to Congress, a small (but growing) industry has developed for analyzing how this should be done. In 1979 and 1986, the House Science Committee published reports, with help from CRS, looking at this issue. In 1992 the Carnegie Commission sponsored a very large effort that looked the processes for providing science and technology advice across the federal government including a separate assessment for Congress. After OTA was ended in 1995, these activities appear to have started up again. In 2003, the Resources for the Future published a report, edited by Granger Morgan, on this topic that was based on a workshop held at Carnegie-Mellon involving, among others, a number of current and former staff from all of the congressional support agencies. In addition there have been a large number of papers and publications on this topic, including some that I wrote several years ago. In fact, it is one of those that I wrote in 1992, when I was still at CRS, that I am using for my talk today with, I hope, some relevant updates.

My discussion about the mechanisms for providing S&T information and advice to Congress focuses not only on the sources of that information and advice, but also on the ways they are transferred from its ultimate source to the Members of Congress. The reason I include the latter is that the transfer process itself has a substantial effect on the quality of the S&T advice that gets to Members.

I have divided these paths into eight categories. That division is somewhat arbitrary, and I am sure there can be arguments about whether a given path is really a separate mechanism or not, but for the sake of discussion we will proceed with the eight.

The first one—congressional staff—is very important because it probably the most common way that S&T information and advice get to the Member. Staff, as you

all know, have to filter and synthesize the information and advice they receive, to some degree, so that it is presented in a way that the Member can process quickly. The capability of congressional staff to do this effectively for science and technology information has expanded over the years because more and more issues have science and technology aspects to them, and a growing number of staff has a science and technology background. That latter, of course, have the potential of doing a more expert job of synthesizing complex S&T information and, on occasion are the source of such information and advice themselves. With the formation of the AAAS Congressional Fellowship program in the early 1970s, the number of such staff has grown dramatically. Many of them stayed with Congress after their fellowship, which has provided a strong base of expertise in Science and Technology for both Member and committee staff.

The next mechanism—formal meetings—are usually briefings provided by experts. The National Academies do a number of these for studies that it releases on topics of interest to the Congress. I also did many briefings of staff and Members when I was at CRS and OTA. Members sometimes will have meetings with these experts to just talk about particular S&T issues, although most formal meetings are focused on particular studies or issues. These meetings can be a very effective to the extent that the Member and the staff have time to discuss a particular S&T-related policy issue. There are also limitations in this process. Perhaps the most important one is that these meetings often do not provide the opportunity for extended discussions about divergent viewpoints on these issues because such views are generally not represented by advocates at those meetings.

The next mechanism is the hearing process. This, of course, is probably the oldest mechanism for delivering advice and information to Congress. In the case of S&T advice, hearings provide a means of delivering, directly to the Members, information—usually substantially summarized—about studies or research carried out by the experts that are testifying. There are limitations, however, in that the discussion periods are usually time-constrained not open-ended. Also, the hearing format is limited to the degree it can explore a particular issue that is contentiousness and on which there is extensive debate.

The congressional support agencies constitute the next path. In my original paper I had four—OTA, CRS, Government Accountability Office (GAO), and the Congressional Budget Office (CBO). Of course, OTA is no longer around. These agencies provide a very useful service to the Congress, and, as a group, they have an almost unique capability to provide truly unbiased analysis. They are limited in the degree to which they can carry out detailed analysis, however, because of their charter and the resources that they have at their disposal. Of the three, CRS and GAO do most of the S&T-related analysis, and GAO recently has been experimenting with performing broader assessments similar to those that were done by OTA. GAO has a contract with the National Research Council to provide them with assistance and expertise so that they can focus on a specific issue in much more detail than they could as individual

staff. CRS is not prohibited from doing similar studies, but the continual call on the Service for short turn-around response makes performing more detailed assessments difficult. I did a couple of such studies, but resource and time constraints mean that you cannot do them very often. As a result, CRS is generally confined to rather specific discussions of issues from a fairly neutral perspective. Such analysis, nevertheless, are useful and CRS is a valuable source of S&T information and advice for staff and Members.

The next mechanism—ad hoc groups—consist primarily of workshops or advisory panels used primarily by congressional committees. One of the last assignments I had at CRS was to assist the House Science Committee with an advisory panel meeting to look at U.S. science policy with goal of recommending changes to the existing policy. The various congressional caucuses also set up advisory panel meetings and workshops that can provide the committees directly with S&T advice. Such groups can focus intensely on a subject, but they are still somewhat limited in how much analysis they can do because they usually meet only once and do not have the resources to carry out detailed analysis.

The next mechanism is the Executive Branch, which is a major source of S&T information and analysis. Indeed, the fact that the Executive Branch has so many resources at its command to do detailed and comprehensive analysis on complex S&T-related policy issues is another reason why the Congress has been adding to its own analytic capability in the ways I have been describing. The Executive Branch is a very useful source of information. Congress often mandates studies be done by the agencies and report back on the results. In addition, agency staff will often brief congressional staff on an informal basis. These briefings are particularly useful in exploring contentious S&T budget issues.

The next mechanism explicitly involves the National Academies, primarily through the National Research Council and Institute of Medicine. Over the past several years, a growing number of NRC and IOM studies have been mandated by Congress. These studies, by the way, are paid for by the agencies subject to the mandate. Sometimes Congress provides the agency with a separate appropriation for the study, but often it does not. In addition, Congress is finding more and more value in those NRC and IOM studies that do not involve a congressional mandate. Most of our studies still fall into this category. One reason for this growing interest is that the Academies have been putting more effort in communicating the results of those studies to congressional audiences These studies, while often on a fairly narrow topic, are, nevertheless, usually about contentious issues for which there is considerable uncertainty about the science and technology involved in the policy issue. It is, however, difficult for the Academies to provide congressionally-requested advice on a regular basis. The fact that such studies are still paid for by the agencies can create tensions in trying to balance the particular goals of each branch. Nevertheless, I believe that the Academies are able to provide

a substantial amount of valuable information and advice to Congress on S&T issues, and that this path will continue to grow in importance.

The last mechanism is somewhat of a catchall of informal processes ranging from a Member reading about relevant information in a journal or newspaper to informal discussions with constituents and colleagues and the like. This is a rather unstructured and not necessarily very reliable approach. It can be, however, an approach that invokes considerable trust by the Member to the degree that he or she is comfortable with the sources of the advice such is often the case with constituents. The reliability concerns can be alleviated to a great degree if the Members are able to take steps to verify the information and advice. Of course, such verification would most likely make use of one of the other mechanism described above.

While these eight mechanisms might not cover every possible path of how S&T advice reaches the Congress, I believe they form a pretty comprehensive set. Often, of course, more than one mechanism will be used for a given issue. How many are used are used for a given topic depends on the intensity of the issue. For issues such as global climate change or stem cells, it is likely that every single mechanism will be used to get information and advice to the Members and the committees.

There are a few observations about this taxonomy that are worth pointing out. First is to note the diversity offered by these mechanisms. This shows up through the wide variety of paths, people, and views within the process. The way the various mechanisms are used and their interaction are also rather unstructured. Congress is one of the most accessible institutions in our society which is one of its principal strengths. As a result, it gets to hear about these issues in just about every imaginable way. The diversity and breadth of advice available, however, can also create a quality problem in that quality can vary considerable among the various mechanisms. The same thing is true with coherence and consistency. On some of the more complex issues, there often can be a great deal of inconsistency among the different sources. And information and advice from supposedly like-minded source can often lack the coherence that you would expect from similar viewpoints. Obviously these occurrences do not help Congress as it attempts to sort through all of the advice it gets in trying to make policy.

In addition, it is important to note that for most policy issues involving science and technology, the latter is not an end in itself. Congress is not going to decide on the validity of the science for a particular issue, although at times it seems to drift in that direction, Rather it debates the policy options involving such actions as regulations, taxes, standards, and other tools at the government's disposal. When dealing with global climate change, for example, Congress is not going to decide on the correctness of various climate science or atmospheric physics findings, but on whether or not to take steps that could have profound economic consequences. The same thing is true with just about every issue involving science and technology. To be sure, the science

and technology is important in that it can affect the need for and the effectiveness of policy actions. But it is usually other factors such as the economic or cultural implications of a policy decision that are the most critical. Sometimes those giving the advice about S&T forget that is the case, and they wonder why their advice has not been taken. They tend to forget that there is usually substantially more involved than the status of the science.

I believe that the existing mechanisms to get science advice to Congress are probably quite sufficient to do the job. It is certainly necessary that all of these mechanisms be available for that purpose. I do not think it would be very productive or fruitful to try to narrow the passageway of S&T advice to the Congress to two or three paths. Of course, even if somebody wanted to, it would never work. As noted, however, there continues to be criticism about the quality of science and technology advice that Congress gets. One of the more recent analyses that I mentioned earlier, argues in particular that a capability for balanced analysis that meets the schedule and needs of Congress was lacking. According to this analysis, development of this capability did not necessarily mean the restoration of OTA, although the type of organization that was proposed was clearly similar to OTA in many respects.

I am not sure personally whether such a step is necessary, but I do think there are a few things that could be done to improve the quality of the S&T advice to Congress through the existing mechanism. I have three points in this connection. First I think that there needs to be more attention paid to providing articulate and transparent risk assessments. Risk assessments are very important for many of the S&T policy issues addressed by Congress. Such issues can range from secondary smoke to the desirability of a launching a service mission for the Hubble space telescope. Second, more advantage can be taken of the unique environment provided by the legislative branch for organizations that carry out assessments of S&T policy issues. It is the one institution in the nation that encompasses all legitimate societal viewpoints and positions, and it is pretty hard to pin a label on an organization that works within and reports to Congress. It is not impossible, to be sure, but it is very difficult because that organization, whether it is CRS, GAO, or CBO, has to represent all those viewpoints and has to be accountable to that the entire Congress. Any new or modified analytical organization or capability that would be put into this situation will be able to benefit by that environment and possess a certain intellectual freedom that does not exist elsewhere in our society. This characteristic can be very important when analyzing complex and contentious S&T policy issues. And finally, I think any enhancement of these mechanisms should encourage more time and resource be spent focusing on the broader area of science and technology for policy. As I noted earlier, most of the S&T policy issues in recent years have been of this kind, and there are many more areas in which S&T will play an important role as we deal with issues of such as privacy, healthcare, aging and so forth.

In conclusion, I think that the current process—the set of mechanism I described—does work pretty well although, as I also noted, some enhancements could very well prove beneficial. Whether we need to bring back OTA or something like it, however, I believe remains to be seen. As an aside, it is also worth considering whether such capability could provide broader benefits to society as a whole, not just to Congress. I believe that one of the benefits of OTA was that it did provide that service. It was a source of studies and policy analysis that provided an understanding of the issues it addressed that just did not exist anywhere else. Furthermore, much of that analysis made its way to the Congress through the other mechanism we have discussed. Constituents, experts, and other interested parties would bring talk about those studies in the course of discussing the underlying issues with Members of Congress and their staff. This factor by itself might make re-establishment of OTA worthwhile. Before making that move, however, I believe that we need to gain clear, unambiguous agreement of just what the problem is we are trying to solve. A lot of the current complaints, I believe, arise because a particular point of view is not adopted or a particular scientific concern seems to be ignored. But, as I mentioned, that is usually because there are other issues involved, not just the science and technology, and even a perfect system for delivering S&T advice would probably not make any difference. But maybe my imagination on this question has atrophied over the years. Nevertheless, I am less eager to see the system substantially changed or modified than I think a lot of others are, and that may be one reason I have not written a book about the subject. That, by the way, in no way is meant to denigrate our next speaker who has written such a book about. Thank you very much, and I will be happy to answer questions.

Daniel S. Greenberg: Thank you and I appreciate the opportunity to be here today. I think Richard has given us very, very good overview of the organizational landscape and how some things work. I first became involved with scientific community when I stumbled into a job at *Science* magazine in the first year of the Kennedy administration. I've been at it ever since. And what strikes me, looking back over those years and writing a few hundred or a thousand articles along the way, is the durability and the stability of the organizational layout of the scientific community and its relations to the federal government. If you look over the table of organization from 1961 and you compare it to what we have today, only an agency or two has been added, none have been subtracted: The EPA came into existence during the Nixon administration and a couple of changes in the White House science office, which was briefly eliminated and then restored. But basically it is the same. I think one reason that is so is that the political community grants a great deal of sovereignty to science and technology in this country, particularly to science. The internal workings of the scientific community are pretty much left to science. NIH and NSF have their peer review systems. They are, to a large extent, immunized against the earmarks; the same can't be said of the Department of Agriculture or Defense or Energy. But by and large, these organizations run their scientific programs with the assent and support of Congress with the lobbyists sort of backing them up. They are left pretty much to themselves

with the obvious exceptions of anything involving reproductive biologies, stem cells and assorted matters like that.

So the scientific community exists in a rather special realm in the American political realm. We have a very unusual situation there, and that is that the scientific community has deliberately severed itself from anything involving electoral politics. We find that doctors and real estate agents, lawyers, pharmacists, they all set up PACs, they contribute money, they are well known politically in Washington – not the scientists. I think that is because the scientists realize that the political community grants them sovereignty with the understanding that if they produce a lot of good science and technology, they will continue to have it that way. Now the lobbies that exist on behalf of science are a wonder to behold, because not only are they pressing for getting science and technology well-financed, but they create the impression that they are doing God's work and that any politician who does not support them is somehow or other against the basic interests of the American people. These are very powerful, subtle lobbyists, they are well financed and they are skillful and they operate, I think, with great effectiveness.

Looking at the Congress, how does the Congress deal with science and technology? Well, in kind of a clunky, haphazard fashion. Certainly it is not well organized in any way that one could say is rational. We have the House Science Committee, for example, that does not have jurisdiction over NIH, which gets half of all non-defense government spending for research. It doesn't have jurisdiction over defense research, which gets about half of all federal money for R&D, but it is called the House Science Committee. The real power often lies with the Appropriations Committees, which, if you look at them, are the least best staffed for dealing with science and technology issues.

Well, how then do we get such good stuff coming out of the pipeline? I think we have to agree that American science and technology are really going pretty well, though you can always argue they could do better and so forth. I think it is the sovereignty that is allotted to the scientific community for its operations. I think it is the high quality of the university system in this country, which is very heavily subsidized by the federal government. The top hundred universities in receipt of federal R&D money really haven't changed very much in the last fifteen to twenty-five years. We still have the top ones; the ones that were at the top twenty-five years ago are still there. Their share of the federal money as a total may be going down, but the dollar amounts keep going up and are actually quite astronomical, Stanford, Harvard, most of the Ivies, the University of California and so forth. Whether or not there is anything in writing within the federal bureaucracy that says that these powerhouses of science and technology shall be maintained strong and relatively independent, I don't know; I have never seen it. But as a matter of fact, the way the system works out, it is virtually guaranteed that huge wads of federal money for research and development and particularly for basic research will be going to these universities ten or twenty-five years from now.

Now any discussion of how well we are doing inevitably brings us back to the long-lorn OTA. Well as a reporter, I covered the conception of OTA. It was a long, hard, difficult romance that led to it being established. It had a terrible, terrible gestation period. The birth was difficult and it almost died in infancy. Finally when Jack Gibbons took it over after three or four other directors had walked away saying, "This is impossible" and on the verge of being ousted, he more or less put it on a good sound footing. OTA made the people who worked for OTA very happy. It was a nice place to work, high morale, six blocks from the Capitol; they didn't have people breathing down their necks and they had interesting problems. It made the scientific community very happy, because many of them were brought in as consultants to work on interesting problems. They put out voluminous reports. The one unfortunate aspect of the reports was that they would be ordered by a Congressional committee and when they were delivered two or three years later, the size of the Manhattan telephone directory, the people who had ordered the report were gone. The recipients would look at this and say, "What is this? What is this all about?" and it would be explained to them that their predecessors had requested the report. So OTA had these real problems and I think the problems were quite illustrated when the crucial votes were coming and OTA was on the gallows. A Democratic congressman who at that time had been in office about seven or eight terms and was not very much involved with science and technology issues but peripherally so, called me up one day and he said, "Hey, this vote is coming up and I want to do the right thing. What the hell is OTA?" I said, "Well surely you have heard of it." "Well, it is in the back of my mind," he said, "I have never seen it. Where is it? Who are they? What would you suggest would be a good vote on this?" It came close to remaining alive; but serious questions have been raised about whether it really did much for the legislative process.

The revival or restoration movement never seems to die away; there is always somebody out there saying, "We have to bring back OTA." I have actually written some articles saying it wouldn't be a bad idea, but I wouldn't go so far as to say that it would be a very good idea. I think it probably, if only in some marginal way, would be beneficial for the Congress to have this in-house service. I don't think it makes much of a difference. I think the most important ingredient is the state of mind of the Congress. We have a Congress that is locked in bitter partisanship now. I think minds are made up before any issue ever comes to the floor or even comes to a committee. Nothing that OTA says, no enlightenment that it is going to shed on the complexities of any scientific or technological issue is going change very many minds or any at all, I would suspect. So I think that is an issue that we can put on the sidelines for a while. It will never go away. Perhaps OTA will come back someday, but in the meantime, I think that science and technology that the Congress supports is progressing pretty well. The country will remain strong in that respect; there is an understanding that the federal government has a very large and continuing responsibility for financing it and by and large leaving it alone because it is pretty well managed internally. And that is how we deal with science and technology on Capitol Hill. Thanks.

Michael Gough: I would like to thank you all for coming. Scientists and engineers became significantly involved in the Federal Government after World War II, a war in which they played a significant role. Engineers were responsible for the production of greatly improved ships, airplanes, tanks, trucks, and other vehicles in previously unheard of numbers. Chemists developed DDT, which essentially wiped out the transmission of many insect-borne diseases. Enhanced production methods made penicillin available to U.S. and Allied troops, markedly improving survival from war wounds and diseases. Nuclear explosions ended the war, and the country learned about and lauded nuclear physicists and engineers. The National Science Foundation, the Federal Government's primary research agency, was born from the war effort. The public had faith in science and supported the growth of science.

The war over, scientists came to Washington to influence policy about science and technology and to assure that nuclear weapons would not be used again. President Eisenhower established a new position, Special Assistant to the President for Science and Technology, and an advisory committee that included some of the giants of World War II science. The Special Assistant and committee advised Presidents Eisenhower and Kennedy, but their disagreements with President Nixon about the prosecution of the Vietnam War caused him to disband the entire White House science advisory organization in 1973.

Before Nixon acted, some veterans of the White House committee turned their attention to Congress and contributed to the establishment of the Office of Technology Assessment in 1972. Part of the impetus for the new office arose from conflicts between the Nixon Administration decisions about certain technologies and the opinions of private and university scientists, who found allies in Congress. To some extent, OTA's origins are rooted in a political conflict between the executive and legislative branches.

In the two decades that passed between OTA's establishment and its demise in 1995, the public's interest in, knowledge of, and hopes for science decreased. "Concerns" became the central word in discussions about science and technology. Who recalled the promise of nuclear power – electricity so cheap that it wouldn't have to be metered – after Three-Mile Island, Chernobyl, and questions about how to dispose of spent nuclear power rods? Sure, DDT killed insects, but had it wiped out songbirds and eagles? Penicillin was yesterday's wonder drug; new strains of bacteria, especially in hospitals, shrugged off its effects and sickened and killed people. Developing new antibiotics seemed doomed to failure. Wouldn't bacteria become resistant to them? The impression spread that industrial and consumer products had been manufactured, used, and disposed of willy-nilly. Weren't the products of science and technology a threat to human health and the environment?

At the same time that the public was losing faith in science, scientists' interest in policy waned. Scientific societies, which, from time to time, had entered the science

policy arena, saw shrinking memberships. There may be overstatement in Dan Greenberg's criticism that scientists are interested only in policy that provides funding for research, but there's truth, too.

Ironically, I think the 1970s, 80s, and 90s should have been a golden time for technology assessment and OTA. After all, technology assessment was to provide guidance about promoting the worthwhile technologies, regulating or eliminating the non-desirable ones, and managing the adopted technologies for the greater good. As a congressional office, OTA enjoyed wonderful advantages in obtaining information. Almost everyone and every organization were eager to work with it. Executive Branch agencies, worried about congressional oversight, were attentive to OTA requests. Companies, trade associations, unions, universities, local and State Governments actively contributed to OTA reports, providing information and access to experts. OTA had an adequate budget and staff to respond to congressional requests for specific studies and to initiate projects of interest to the office.

But in 1994, Republicans won both Houses of Congress, and their "Contract with America" promised to reduce the size of government. Could there be a more tempting target for elimination than a congressional office? "Yes," Congress could say, "we're making the tough decisions; we're axing one of our own offices." Moreover, it was easy. As a congressional office, OTA could be "zeroed-out" simply by ending its funding. There was no need for that messy business of revising the authorizing legislation for the Department of Energy or Department of Education. Even better, because of its early sponsorship by Democrats and, more importantly, I think, because of the long-time Democratic domination of Congress, OTA was characterized as a "Democratic office," and, often as a "Kennedy office." The Republican Congress decided that, at best, OTA was not needed, and, at worst, that it had failed. Just as OTA was born out of a political conflict, it died in one.

Endeavors to measure OTA's successes have produced mixed results. Robert Walker, former chairman of the House Science Committee, judges OTA harshly. When he surveyed House members, he said, no member told him that OTA had been important in legislation.

Bruce Bimber, a policy researcher, found no one who cited a single case of a member of Congress voting for or against a bill chiefly on the basis of an OTA study. That's no surprise. OTA reports emphasized possible options for pressing problems and didn't come down on the side of specific actions. More importantly, Bimber found that references to OTA are "nearly absent" from *The Congressional Record* and actually decreased through the 1980s and 90s, when the office was most productive.

In contrast, Adam Keiper draws attention to legislation on polygraph testing, worker dislocation, the trucking industry, post-Cold War defense spending, and preventive interventions in healthcare that correlate closely with OTA report language. In my

own experience, I know that some decisions based on OTA research were made very early in the congressional process, well before any legislation was drafted. I'm sure that other former OTA staffers had similar experiences, but it's probably impossible to make an objective and quantitative study of such informal effects.

However difficult it is to measure OTA's importance to the legislative process, the office was productive. It produced about 400 assessments (its principal products – book-length reports), and hundreds of shorter studies, memoranda, and letters for Congress. Moreover, OTA staffers testified before congressional committees on a wide variety of subjects. The OTA assessments were popular with university students and faculty, trade associations, and various NGOs, which relied on them as accurate, usually well referenced, sources of information about technologies and their pros and cons. As Dick Rowberg said, members of those organizations sometimes took information from OTA reports to members of Congress.

Why, then, was OTA unimportant to the legislative process?

It's part of conventional wisdom that OTA was slow, often producing reports after legislative actions had been completed, but the National Academy of Sciences (NAS), proposed as an alternative to OTA, is slow too. Richard Belzer, formerly at the Office of Management and Budget, commented on a NAS study that has not yet been released. "What's the big deal? It was an 18-month project that began June 2004. Remember the Academy's motto: 'We're outrageously expensive, but slow.'"

In my opinion, OTA initiated too many projects that were of little importance to Congress. The projects were interesting to the office, and the Technology Assessment Board, the six Senators and six Representatives who oversaw OTA, could be sold on some such projects. Some or many or, more likely, most of those OTA-initiated studies had little legislative importance. To be successful, a congressional science and technology advice organization must work on topics that are important to legislation. It must also be structured in such a way that the minority party in the Houses of Congress can use it. This, I think, is a major obstacle, and it may be impossible to overcome.

A number of models have been proposed for successors or alternatives to OTA, but none that I have seen adequately addresses the problems that doomed OTA. I think that some insights might be gained from an examination of the workings of the Congressional Budget Office (CBO), which was established at the same time as OTA. As part of the CBO legislation, Congress requires its committees to consult with CBO and to respond to its comments. When Congress requires committees to find budget cuts to compensate for proposed increases, they have to pass the numbers before CBO to see that they add up. Congress can always disregard CBO, but CBO is part of the process.

Perhaps legislation that establishes a science and technology advisory office could require that appropriate congressional committees pay attention to the office's advice. There's no guarantee that the advice would be followed. As Dan Greenberg summed it up in nine words, "In conflicts between the two, politics triumphs over science."

Nevertheless, as a citizen, I value Congress' informed consideration of all aspects of legislation, including those related to science and technology. I am certainly in favor of Congress receiving science and technology advice, and a congressional office might play a valuable role. Before that can happen, if it happens, a lot of thought and study about the operation and structure of such an office will be necessary.

Questions and answers.

Question: Given the multiplicity of agencies and options and pathways for getting scientific advice into the Congress as you described, Dr. Rowberg, in the panel's view, are there sufficient instruments already in play to provide the kind of information on the qualitative side and the quantity of information at the same time into the Congress without needing to modify that system or pursue other structures?

Rowberg: I still don't know exactly what the problem is in the sense of where is it that there is a substantial breakdown and failure by Congress with respect to science and technology policy. People can cite all kinds of anecdotes, and clearly some legislation has been enacted that didn't anticipate changes in technology. Congress is in the process of reauthorizing the Telecommunications Act. Many consider the current Act to be a failure, partly because a lot of telecommunications technology that exists today wasn't anticipated. It is not clear, however, that you could have anticipated a lot of that technology when the Act was first passed, and even if you could have, it is not quite clear what exactly should have been done at the time. I think you had to see things unfold. I don't believe, however, that there are too many examples like that. So I am not quite sure where the problem lies. Now if you can get a good definition of the problem, and perhaps nobody can (though just because I can't doesn't mean it doesn't exist), then I think you can take a much better look at what kind of organization or mechanism should be established.

Greenberg: I think that one of the problems that faces Congress with science and scientific and technological issues is the superabundance of material which is showered on both Houses. When committees want to find an honest broker to help them sort out the materials, there are many, many places that they can go to: there are think tanks and universities, the Congressional Research Service, there is no shortage of that. But most of the issues that come before the Congress that seem to tie them up in knots are not so much scientific and technological issues, but they are political and budgetary issues. Take the issue that is now concerning the allocation of the budget of the Space

Agency. There isn't enough money for the scientific program, the planetary research program. One reason there isn't enough is that the International Space Station is gobbling up a rather large, some would say a disproportionate, share of the budget. Now that is not a scientific or technological problem; it is essentially a political problem. We reap some political benefits from the International Space Station, or we expect to. The scientific results are enchanting, they are interesting and ultimately they may be useful, but they don't have the immediate political benefits. So there is no way of valuing, of setting up any sort of scientific scale that can weight those two things. And I think that is a general problem that faces the Congress when it comes up against scientific and technological issues.

Gough: I don't know. As Dan said and I am sure Dick will agree, OTA was a wonderful place to work. If you read the little piece I wrote for the Marshall Institute, what I point to are times when OTA was actually asked by Congress to make a decision about something. We were asked to make a decision about whether it would or not it would worthwhile to study the veterans who attended the atomic bomb tests in the western deserts in the 1950s. We told the Congress, "No, because even if the estimates of radiation exposure were off by a factor of seven, there would be no increase in cancer risk." The response of Congress was to compensate the veterans for every cancer known to man. So we didn't do the study and they made a decision to compensate, even though there isn't any evidence for harm. In the case of Agent Orange, we did much the same thing, saying that there is nothing there. And finally Congress took Agent Orange away from OTA and gave it to the Institute of Medicine, which, in its own words, didn't evaluate the information in the way that scientists usually do. So, even when OTA did things that were specifically requested, Congress could ignore us. I think that one thing that OTA gave to the community, not so much to Congress, but to the community, was it did give pretty authoritative, generally readable descriptions of technologies that were important to the country. That may not be a function that Congress wants to support, but I think that was a good thing that we did.

Question: Do you think one useful function of OTA – and I worked at OTA for a few years – was to try to achieve a scientific consensus in areas that were highly contentious and often politicized? For example, what I remember was verification of the test ban, where they actually brought together a wide range of experts and they did reach consensus on the feasibility of verification. So I think that was a very useful function.

Gough: Yes, I think it was good. The advisory panels, I think, at OTA were a marvel to behold because there would be some people right on the fringes – not the lunatic fringe, but just at the edges on both sides or on three sides, and those meetings were interesting. They were murder to run, but it was interesting to read the transcripts of them. But the Academy does that to some extent.

Question: To give a specific example where I think they did have a failure, that was in 1973, a report was issued based upon state-of-the-art computer models that pre-

dicted that the global drive toward using natural gas and a number of other things by the end of the 20th century. The computer models were not verified and there was a failure to point out that unverified computer models are nothing more than sophisticated speculation and not scientific knowledge. An entity that would point these out would address some of the issues that are today as well.

Rowberg: I think that that's possible. I think that the National Academies has the capability to do that, too. For example, recently we held a workshop on whether world oil production has actually peaked, although we did not look so much at the computer models as we are did at the geology and current forecasts. Back in 1973, things were a lot less well defined in terms of modeling. I am just not quite sure exactly what we would have found if we did the study you suggest. Obviously the projections were not correct. I am just not sure how we could have sorted that out at the time. It would have been a very difficult thing to approach. It is possible, however, that some analysis like that could be done now the we understand the models better and have three decades of additional data by an organization such as a revised OTA or by the Academy.

Question: I don't think any of the panelists addressed the commonly held contention that OTA tilted to the left. Mike, you mentioned it circumspectly, saying that Republicans believed that this had happened. I would be interested in hearing your opinions about that. Was OTA, as has been said in the 1980s and mid-1990s, tilted to the left?

Gough: I think it was inevitable. Democrats controlled the Congress in most of those years. It was very hard to find any Republican interested in OTA projects, primarily, I think, because the GOP had so few staff members that to go to a Republican staffer and ask him to be interested in an OTA report or to initiate one was unrealistic; that was the last thing on his mind. If you think that was a problem, there was also a problem in the management of OTA. Management was too ready to turn to the federal government in making suggestions for solutions for problems and not so interested in looking at either state and local solutions or at the private sector. I think these things are addressable, except the issue of minority staffing.

Rowberg: I would have to agree with Michael. It wasn't really overt, but there were certainly tendencies on the part of OTA staff to think that certain solutions were preferable, that Republicans or conservatives might not think were so preferable. I think also there was the notion for the several years of OTA's existence, at least, that conservative Republicans were less interested in the kind of analysis that OTA did. Rather, they were much more interested in the market approach to just about everything. While I believe that a market approach is to be preferred, that doesn't, I think, obviate a need for or the importance of some kind of broader analytical framework for a lot of policy issues. There are a lot of assumptions that the government and everybody have to make for any policy decision. Nevertheless, I believe that a restructured OTA or similar capability would have to make sure that it looks very carefully at trying to figure

out how to work closely with the market perspective as well as with a more interventionist perspective.

Kueter: Gentlemen, thank you very much for your presentations.

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