SCIENTIFIC AND TECHNICAL ADVICE FOR THE U.S. CONGRESS

HEARING

BEFORE THE

COMMITTEE ON SCIENCE
HOUSE OF REPRESENTATIVES

ONE HUNDRED NINTH CONGRESS

SECOND SESSION

JULY 25, 2006

Serial No. 109–57

Printed for the use of the Committee on Science

Available via the World Wide Web: http://www.house.gov/science

U.S. GOVERNMENT PRINTING OFFICE

28–757PS WASHINGTON : 2006

For sale by the Superintendent of Documents, U.S. Government Printing Office
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SCIENTIFIC AND TECHNICAL ADVICE FOR THE U.S. CONGRESS

TUESDAY, JULY 25, 2006

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE,
Washington, DC.

The Committee met, pursuant to call, at 10:09 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Sherwood L. Boehlert [Chairman of the Committee] presiding.

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

Scientific and Technical Advice for the U.S. Congress

Tuesday, July 25, 2006
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

Witness List

Panel 1

Representative Rush Holt

Panel 2

Dr. Jon Peha
Department of Engineering and Public Policy
Carnegie Mellon University

Dr. Al Teich
Director, AAAS Directorate for Science and Policy Programs
American Association for the Advancement of Science

Dr. Peter Blair
Executive Director
Division on Engineering and Physical Sciences
National Research Council

Dr. Catherine T. Hunt
Leader, Technology Partnerships
Rohm and Haas Company

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HEARING CHARTER

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

Science and Technology Advice for the U.S. Congress

TUESDAY, JULY 25, 2006
10:00 A.M.—12:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Tuesday, July 25, 2006, the Committee on Science of the U.S. House of Representatives will hold a hearing to examine how Congress receives advice about science, and whether and how the mechanisms for providing that advice need to be improved.

2. Witnesses

Panel 1:

The Honorable Rush Holt is the Representative from the 12th District of New Jersey.

Panel 2:

Dr. Jon Peha is a Professor in the Department of Engineering and Public Policy and Electrical and Computer Engineering at Carnegie Mellon University. He also was the co-editor with M. Granger Morgan of *Science and Technology Advice for Congress,* a compilation of policy papers evaluating existing systems and providing recommendations for science and technology advice for the legislative branch.

Dr. Al Teich is the Director of Science and Policy Programs at the American Association for the Advancement of Science (AAAS). He is also the author of *Technology and the Future,* a collection of papers on how technology and society interact.

Dr. Peter Blair is the Executive Director of the Division on Engineering and Physical Sciences at the National Academy of Sciences. He previously served as Assistant Director of the Office of Technology Assessment.

Dr. Catherine Hunt is the President-elect of the American Chemical Society and the Leader for Technology Partnerships (Emerging Technologies) at the Rohm and Haas Company. She is a member of the Executive Board of the Council for Chemical Research.

3. Overarching Questions

The hearing will address the following overarching questions:

1. What resources are available to Congress to provide scientific and technical advice or assessments? How does Congress use these resources?
2. What are the strengths and weaknesses of the current system through which Congress receives scientific and technical advice? Overall, does the current system effectively meet Congress' needs, or do gaps exist?
3. What options are available to supplement or improve existing resources to provide advice and assessments on scientific or technical issues?

4. Brief Overview

- Congress currently receives information and advice on science and technology issues from, among others, the National Academy of Sciences (NAS) and the Congressional Research Service (CRS), science and engineering professional societies, interest groups and think tanks. Additionally, some Congressional offices employ staff with scientific backgrounds.

- From 1972 to 1995, the Office of Technology Assessment (OTA), a Congressional support office, prepared reports at Congressional request on science and technology issues. In 1995, funding for OTA was eliminated.
- Reports from scientific groups and experts released in recent years have criticized the lack of a dedicated source of scientific and technical advice and assessment for Congress. They argue that the resources currently available do not always provide Congress with in-depth analysis, including analysis of multiple policy options, in a form and on a schedule that is useful to legislators.
- Congressional advocates of creating (or recreating) a Congressional entity for science advice responded to this criticism, in part, by creating a pilot project within the General Accounting Office (GAO) to provide advice on specific issues. The Legislative Branch appropriation in fiscal years 2002–2004. GAO has completed four assessments as a result—one each on biometrics, cyber security, wildland fires and cargo security.
- Advocates of an expanded scientific and technical assessment capability to support the Legislative Branch have proposed several options, including: (1) augmenting the capabilities of existing Congressional agencies, (2) expanding the use of the National Academy of Sciences, (3) increasing the number of privately-sponsored Congressional science and engineering fellows, (4) establishing a small Congressional office that would farm Members' requests for information out to expert non-governmental organizations, or (5) chartering a non-governmental organization dedicated to providing science advice and technology assessment for Congress.

5. Background

History of the Office of Technology Assessment

Congress created the Office of Technology Assessment (OTA) in 1972 to aid Congress "in the identification and consideration of existing and probable impacts of technological application."[1] All technology assessments conducted by the office were approved by the Technology Assessment Board, a bipartisan body made up of six Senators and six Representatives. Assessments could be requested by a committee chair, the ranking minority member of a committee, the majority of members in a committee, the Technology Assessment Board, or the director of OTA.

Funding for OTA was eliminated in 1995 as part of an effort to reduce size of the federal budget and the Congressional budget and bureaucracy. Proponents of eliminating OTA also argued that OTA reports took over a year to complete (as do many National Academy reports) and, therefore, were not available to legislators in a timeframe that was useful to them, and that Congress would be able to obtain similar advice from NAS, CRS, and GAO. Also, some Members felt that some of the reports produced by OTA were not pertinent to the legislative agenda or reflected a political bias.

GAO pilot program in technology assessments

The Fiscal Year 2002 (FY 2002) Legislative Branch Appropriations Conference Report allocated $500,000 to GAO to conduct a study as part of a pilot project in technology assessment. The resulting report, released in November 2002, was entitled *Using Biometrics for Border Security.*[2] FY 2003 and FY 2004 appropriations reports contained similar allocations, and GAO completed another technology assessment in May 2004—*Cyber Security for Critical Infrastructure Protection.*[3] GAO completed the pilot project with two other technology assessments—*Protecting Structures and Improving Communications During Wildland Fires,* released in 2005, and *Securing the Transport of Cargo Containers,* released in 2006.

In addition to providing funds for these pilot technology assessments, Congress requested two reviews of the pilot project's performance. Overall, the external review, completed in 2002, reflected very favorably on GAO's performance. The reviewers found that GAO did a "very good job" given the constraints—a very short timescale for the assessment and no previous experience with conducting technology assessments. However, the reviewers also noted that GAO has few staff with adequate

[1] OTA was created by the *Technology Assessment Act of 1972* (P.L. 92–484).

[2] *Using Biometrics for Border Security,* Report GAO–03–174, is available on-line at *http://www.gao.gov/new.items/d03174.pdf.*

[3] *Cyber Security for Critical Infrastructure Protection,* Report GAO–04–321, is available on-line at *http://www.gao.gov/new.items/d04321.pdf.*

knowledge and experience of broad scientific and technical issues necessary to evaluate a range of policy options.

6. Proposals for Improving Science Advice to Congress

Over the past several years, numerous proposals have been offered for improving Congress' access to science advice and technology assessment through legislation and policy recommendations. Bills to directly re-establish the Office of Technology Assessment were introduced in the 107th and 108th Congresses. Additionally, legislation to create new Congressional agencies responsible for providing non-partisan scientific and technical advice has been introduced. In June 2004, Congressman Holt introduced H.R. 4670, which would build upon the pilot project at GAO by establishing within GAO a Center for Scientific and Technical Assessment. (That bill has not been re-introduced.) The Center would be dedicated to providing Congress with information, analysis, and advice on issues related to science and technology. In the Senate, Senator John Kerry introduced S. 1716 in 2001, in which Section 153 created a Science and Technology Assessment Service to provide ongoing independent science and technology advice ". . .within. . .the legislative branch." Assessments would have been conducted using experts selected in consultation with the National Academy of Sciences.

Science and Technology Advice for Congress, a collection of essays by various authors, analyzes a number of potential means for expanding the scientific and technical assessment capability for the Legislative Branch. In addition to legislating mandating the creation of a dedicated Congressional support office in this area, authors representing groups such as AAAS, NAS, and various universities suggest improving the access to and responsiveness of private organizations capable of providing expert advice. One recommendation is to establish a cadre of private organizations who are prepared to quickly respond to questions distributed by a central office in Congress with knowledge of their areas of expertise. Another suggestion involves expanding the role of privately-sponsored Congressional science fellows by increasing the number of fellows available for employment in Congressional offices and better preparing them to deal with policy issues that arise in these positions. The editors, Morgan and Peha, note that "any analysis process must continuously work to build widespread support among members on a bipartisan, bicameral basis, so that when conflicts arise. . .support for the analysis institution remains firm."[4]

7. Questions for the Witnesses

- What resources are available to Congress to provide scientific and technical advice or assessments? How does Congress use these resources?
- What are the strengths and weaknesses of the current system through which Congress receives scientific and technical advice, particularly with regard to depth and breadth, timeliness, and impartiality? Overall, does the current system effectively meet Congress' needs, or does a significant gap exist?
- What options are available to supplement or improve existing resources to provide assessments and advice on scientific or technical issues?

[4] Morgan and Peha, 103.

Chairman BOEHLERT. Good morning. I want to welcome everyone here to—for today's hearing on the vitally important topic of how Congress should get scientific advice. I want to thank Dr. Holt for urging us to have this hearing.

We have an excellent panel of witnesses before us today, and I hope they will give us some specific ideas for how we might improve the mechanisms for providing science advice to the Congress. I think we need to get beyond the debate about reviving the Office of Technology Assessment.

I must add I am a very strong defender of OTA, and I voted against defunding it, but the others didn't see the wisdom of the path that Dr. Holt and Dr. Ehlers and Dr. Bartlett and all our distinguished scientists were leading us down. Unfortunately, we didn't prevail. But OTA is not likely to be coming back any time soon.

I also have to say, as a proponent of OTA, that the reaction to the loss of OTA has been somewhat disproportionate. If you listen to the scientific community, you might think that OTA was the only thing separating Congress from barbarianism. We do have plenty of current sources of information, particularly the National Academies, and boy, do they do wonderful work. So the question before us today is: what specific gaps exist, and how can they be filled?

Also, much of the lament one hears about OTA's demise is really not a concern about what advice Congress is getting, but rather, about what decisions Congress is making when it gets that advice. So, it is important to remember that not all people will reach the same policy conclusions based on the same scientific information, even if they understand and accept that information.

Perhaps the most dangerous fallacy in Washington is: "If you knew what I know, you would think like I think." Let us not confuse policy differences with ignorance.

Which is not to say that Congress does not sometimes display ignorance, sometimes willful ignorance. But that is not a problem of not receiving advice, it is a problem of not listening to it. To take one current example, a high profile example, I might add, the National Academy, a few weeks ago, released a clear, balanced, and thoughtful overview of the current understanding of global temperature over the past 1,000 years. Some Members have taken that report to heart. Others are trying to distract from its conclusions by focusing on individual papers that have already been superseded. That is their right, but my only point here is that debate says nothing about the quality of information Congress is receiving.

I like to tell people that I work in an institution, and in a town, where everybody likes to say they are for science-based decision-making, but when the overwhelming scientific consensus leads to a politically inconvenient conclusion, then they want to go to Plan B.

Well, I look forward to hearing from our witnesses today, but in discussing what kinds of information science needs, let us make sure we are not confusing the availability of information with any other issues.

With that, I am pleased to turn to Mr. Gordon.

[The prepared statement of Chairman Boehlert follows:]

PREPARED STATEMENT OF CHAIRMAN SHERWOOD L. BOEHLERT

I want to welcome everyone here for today's hearing on the vitally important topic of how Congress should get scientific advice, and I want to thank Mr. Holt for urging us to have this hearing.

We have an excellent panel of witnesses before us today, and I hope they will give us some specific ideas for how we might improve the mechanisms for providing science advice to the Congress. I think we need to get beyond the debate about reviving the Office of Technology Assessment (OTA).

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So I look forward to hearing from our witnesses today. But in discussing what kinds of information science needs, let's make sure we're not confusing the availability of information with any other issues.

Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman, and thank you for scheduling a hearing on this important topic of science and technology advice to the Committee, and we are particularly pleased that Congressman Dr. Holt is among our witnesses, and thank you for being here, Rush. You lend a particular dual role to this hearing.

We appreciate your leadership on this topic, and are pleased to join you in seeking better ways to incorporate the best available scientific and engineering knowledge to our legislative activities.

It was over 40 years ago that the Science Committee first addressed the topic of science advice to Congress. Congressman Mim Daddario, a Member of the Committee, a charter Member of this committee, and Republican Chuck Mosher co-authored the legislation that created the Office of Technical Assessment.

It was Charles Lindbergh who got Congressman Daddario focused on technology assessment. In the early 1960s, Lindbergh was concerned that the Earth was heading for disaster, unless the balance between science and ecology were properly adjusted. Does my friend from California, Mr. Rohrabacher, think that this sounds familiar?

Mr. ROHRABACHER. Well, I certainly do respect Mr. Lindbergh.

Mr. GORDON. Lindbergh felt Congress needed specialized scientific expertise to analyze this and other tough problems. Daddario and Lindbergh continued to talk about technology assess-

ment for several years. During the 1960s, the Committee had many hearings, and issued several reports on science advice to the Congress that paved the way for legislation creating OTA in the early 1970s.

In the early '70s, the legislation that established OTA was reported unanimously by the Committee on Science. The Committee leadership then worked bipartisanly to get the bill through the House and Senate.

During its twenty years of operation, OTA created 700 reports on the science and technology behind issues of importance to Congress.

We could use a service like OTA today, since relatively few Members of Congress have formal training and experience as scientists and engineers, and since much of the information we receive comes from advocates selling their points of view.

In the years since OTA, we have had an increasingly difficult time of reaching consensus on a wide variety of these topics. We certainly could use in-house help in sorting through conflicting expert opinion.

I therefore look forward to the testimony of today's experts, and to taking the first steps toward improving the way in which Congress receives and uses scientific and technical advice.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Gordon follows:]

PREPARED STATEMENT OF REPRESENTATIVE BART GORDON

Mr. Chairman, thank you for scheduling a hearing on the important topic of science and technology advice to the Committee and for including Congressman Holt among the witnesses.

We appreciate your leadership on this topic and are pleased to join you in seeking better ways to incorporate the best available scientific and engineering knowledge into our legislative activities.

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I look forward to the testimony of today's experts, and to taking the first steps towards improving the way in which Congress receives and uses scientific and technical advice.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Good afternoon. I want to thank the witnesses for appearing before our committee to examine how Congress receives advice about science and discuss how this process can be improved.

For over twenty years, the Office of Technology Assessment (OTA) prepared reports by Congressional request on science and technology issues. In 1995, funding for OTA was eliminated. Currently, Congress receives information and advice on science and technology issues from the National Academy of Sciences (NAS) and the Congressional Research Service (CRS), science and engineering professional organizations, interest groups and think tanks. In recent years, reports from scientific groups have raised concerns over the lack of scientific and technical advice and assessment for Congress.

I am interested to hear from our witnesses what options are available to supplement or improve existing resources to provide advice and assessments on scientific and technical issues given recent concerns. I look forward to hearing from the panel of witnesses.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF REPRESENTATIVE EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman and Ranking Member. I would like to welcome today's witnesses and thank you for the perspective you will provide today.

Congress relies on experts from the scientific research community to assess the needs of our national scientific enterprise. It is important to know how America ranks compared with other nations.

Our competitive nature is what makes Americans, with our capitalistic society, one of the richest nations in the world. Americans are leaders.

In order to maintain our cutting edge when it comes to technology matters, we lawmakers need a consistent and reliable source of unbiased advice.

The National Academy of Sciences, the Congressional Research Service, professional societies, and think tanks are all examples of current advisors to Congress.

It is interesting to hear your perspective on whether the way Congress receives its advice needs to be changed or even improved.

Thank you, Mr. Chairman. I yield back the remainder of my time.

[The prepared statement of Ms. Jackson Lee follows:]

PREPARED STATEMENT OF REPRESENTATIVE SHEILA JACKSON LEE

Mr. Chairman and Members of the Committee, I appreciate the fact that this hearing has been called today in order to re-examine the way in which Congress receives scientific and technological advice.

I would like to thank my colleague Mr. Holt for his interest and commitment to addressing this issue, as well as the other witnesses for testifying today: Dr. Blair, Dr. Peha, Dr. Teich, and Dr. Hunt.

As early as the 1950s, Members of Congress understood the importance not only of scientific and technological advice, but of even-handed "Technology Assessment Board" to explore and report on how technological advances would affect the environment. This lead to the creation of the Office of Technology Assessment in 1971.

For those who utilized the studies and resources of the OTA, its benefits and value were never in question. Sadly, the agency was cut in 1995 as part of a government-wide belt tightening, and Congress lost its most reliable and balanced science analysis tool.

The Office of Technology Assessment can be compared to the other three remaining legislative branch research organizations: the Government Accountability Office, the Congressional Budget Office, and the Congressional Research Service. As well respected as these organizations are, none of the three have the infrastructure, staff, or expertise to conduct thorough scientific examinations into legislative proposals or impact analyses on public policy.

Clearly, as we move into the 21st century, we will need increasingly sophisticated resources with which to develop the law of the land, and the public policy of our future. It is crucial that Congress make informed, intelligent, and evidence-based decisions in crafting this nation's energy, technology, and science policy. I hope that the hearing today will be able to further advise and inform us on how to proceed.

Thank you Mr. Chairman, and I yield the balance of my time.

Panel I:

Chairman BOEHLERT. Thank you very much, and now, we will hear from our first witness, the very distinguished witness, and a colleague with whom it is a pleasure to work, Dr. Rush Holt.

STATEMENT OF HON. RUSH HOLT, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Mr. HOLT. Thank you, Mr. Chairman, and I thank you and Mr. Gordon for those good remarks.

I know in this committee, you are accustomed to hearing testimony of astounding novelty about really path-breaking advances, but I often tell witnesses, when they are testifying before a Congressional committee, that they shouldn't underestimate the pleasure they give an audience by telling them something they already know. And in this case, I will talk about something that, at least if we are honest with ourselves, we already know, and that is that none of us in Congress either have the time, or in many cases, the ability to analyze scientific and technological advances, make reasoned, logical determinations about their direction and the impact on industry and on nations and on education, on our citizens. And yet, we vote on decisions about topics on a regular basis that include technical and scientific components. The connections to science and technology are not always obvious, especially to Members who avoid science and technology, which, I must say, are most Members. So, if we are honest with ourselves, we have to say we cannot do this alone.

I will be brief, because we have some excellent people speaking after me, and I have read their testimony, I have talked with some of them, and I think we can learn a lot about what maybe we already know. Congress used to have an in-house professional office dedicated to providing technological assessment services. Mr. Gordon referred to Representative Daddario, for example, who helped set this up. And Congress received regular reports, in a legislatively relevant form, on such topics as agricultural technology, alternative fuels, arms control, banking, business and industry, communications, climate change, computer security, defense technology, economic development, education, energy efficiency, fishing, health, technology, international relations in technology transfer, natural disasters, nuclear energy, nuclear war and weapons, oceanography, oil, gas, mineral resources, transportation, yes, all of those things, on a regular basis.

And Congress decided in 1995 that we didn't need an in-house body dedicated to technological assessment. The technological assessment could come, we told ourselves—this was before my time here—could come through committee hearings, through CRS reports, through experts in our district, through think tanks, through the National Research Council and the National Academies.

Now, you and I know that Members of Congress have a low comfort level with technology in general and are generally unable to probe beyond our personal understanding or the briefing books crafted by our staffers, but let us look at the history. In the ten years since we said that these various groups could provide the

technical advice that we need, we have not gotten what we need in order to do the people's work. We should acknowledge that.

Yes, there are organizations that separate us from the barbarians, as the Chairman has said, Congressional Research Service, the National Academies, institutions like Stanford or Carnegie Mellon or Princeton. We have organizations like the AAAS, the American Chemical Society.

We do not suffer from a lack of information here on Capitol Hill, but from a lack of ability to glean the knowledge and to gauge the validity, the credibility, and the usefulness of the large amounts of information and advice that we receive.

And there are real gaps in what Congress gets. We are not getting what we need, I would argue.

But why is this of such importance to Congress? Why do we need a specialized in-house scientific and technical assessment organization or organ? Well, I can think of three what I would call compelling reasons. Science and technology pervade almost all of the issues before us. If you look at today's hearings in the House and the Senate, or yesterday's, or last week's, you will find a number of topics that are being considered that most Members of Congress don't even think of as technological issues, and yet, they have technological components. What we will have on the Floor this week, what we had on the Floor last week, had technological components that in many cases, were not considered fully.

Secondly, the language and technologies are specialized and complex and require translation for Members and their staff. Third, Members think science and technology are for scientists and technologists, thus avoiding science and technology themselves. I think every Member of Congress is aware of the social, economic, moral, and political aspects of the issues before us, and in many cases, Members are good at analyzing those things. Not so with the scientific and technological aspects of the issues before us. Members duck those aspects, flee them, ignore them, or perhaps most often, march off oblivious to them.

The Science Committee is of least concern. Most Members here recognize that the issues that come before you have technological components, and you get the help necessary. However, this may not be true for other committees, all of which, every one of which, handles topics that have some scientific and technological components, whether it is the Agriculture Committee, the Appropriations Committee, the Education and Workforce Committee, or on down the line.

We need to fill the gaps in our science and technology advice. Technology has been studied extensively by scholars, some of whom we will hear from today, and the lessons are clear. The issues are too complex and the stakes are too high for us to try to wing it on issues like stem cell research or biofuels or technology transfer or healthcare. But if we are honest with ourselves, we should say that we actually don't even need scholars, however good today's witnesses are. We don't need scholars to tell us we need help. If we are honest with ourselves, we know it. We need a dedicated, in-house, permanently staffed organization to give us objective, nonpartisan advice on science and technology issues.

We know it can be done. We have done it before, as a body. I hope we will find a way to do it again, and I thank the Chairman for leading us off on this.

[The prepared statement of Mr. Holt follows:]

PREPARED STATEMENT OF REPRESENTATIVE RUSH HOLT

Mr. Chairman and Members of the Committee, I thank you for the opportunity to explore the state of science and technology advice and assessment for Congress. You each know my passion for this subject, and I appreciate the opportunity to speak with you on this matter today. I look forward to working with you on this critical topic in the future.

To use a cliché, but to set the stage properly, our world is changing at an accelerated rate brought on by technology. The invention of the transistor in 1947 led to the development of the computer. DARPA, our own military R&D facility, invented the Internet, and in 1989, a scientist at the Center for European Research in Nuclear Physics in Switzerland, invented the World Wide Web to meet the demand for automatic information sharing between scientists working at different locations around the world. Nothing has been the same since these advances; we all depend on our Blackberries and cell phones to keep appraised of the happenings of the world. However, technological advancements extend beyond communications into health care, education, transportation, intelligence and military activities, agriculture, environmental protection, as well as the very process of government from voting to judicial punishments, to agency record keeping. We see the effect of technological advances reverberate around the globe. The gap between industrialized nations and developing nations grows for some. Others nip at our heels to gain the world lead in one technology or another. Human interaction across the globe will never be the same, and it is hard to know where it is going. Yet, that is our job as Members of the United States House of Representatives. We were sent here by our constituents to lead our nation into the future, securing the livelihoods of each person we represent as well as protecting and maintaining the competitive edge of our nation in the emerging global knowledge economy.

None of us in Congress have time to analyze scientific and technological advances and make reasoned, logical determinations of their direction and impact on industry, nations, and education, but we vote on decisions about topics on a regular basis that include technical or scientific components. The connections to science and technology are not always obvious, especially to Members who avoid science and technology, which are most Members. We cannot do this alone.

Congress used to have an in-house professional office dedicated to providing technological assessment services. Congress received regular reports in a legislatively relevant form on such subjects as agriculture technology, alternative fuels, arms control, banking, business and industry, communications, climate change, computer security & technology, defense technology, economic development, education, energy efficiency, the fishing industry, health and health technology, international relations and technology transfer, natural disasters, nuclear energy, nuclear war & nuclear weapons, oceans and oceanography, oil, gas, and mineral resources, transportation, and waste management. Congress decided in 1995 that we did not need an in-house body dedicated to technological assessment.

The technical assessment could come, we told ourselves (before my time here), through committee hearings, CRS reports, experts in our district, think tanks, and the National Academy of Sciences. Now, you and I each know that Members of Congress have a low comfort level with technology and are generally unable to probe beyond our personal understanding or the briefing books crafted by our staffers. In the ten years since we said these various groups would provide the technical advice we need, we have not gotten what we need in order to do the people's work. We should acknowledge that.

The Congressional Research Service does a good job of gathering the current information from a myriad of sources and presents the issues clearly in its reports. The GAO has taken upon itself to do some technical assessments. Some of us represent districts rich in scientific and technological expertise, in business, academia, or national laboratories and we informally or formally draw on the knowledge of our constituents. The National Academy of Sciences has the National Research Council, which completes studies for the Federal Government including recommendations of actions to be taken by the agency or branch of government. Some professional societies have started to reach out to Congress, and you will hear from the American Association for the Advancement of Science and the American Chemical Society

today about what they do for Congress as far as technical or scientific advice or assessments.

We do not suffer from a lack of information here on Capitol Hill, but from a lack of ability to glean the knowledge and to gauge the validity, credibility, and usefulness of the large amounts of information and advice received on a daily basis. Although we would like to believe that the scientific and technical advice and assessment provided from outside remains politically neutral, this is not necessarily the case. In general, groups tend to be slow in responding to real-time needs of Members of Congress or their staffers in terms of science and technology assessment or advice, they often do not know what is happening in the halls of Congress, and have their own agendas.

There are real gaps in what Congress gets.

We are not getting what we need.

We need unbiased technical and scientific assessments in a Congressional timeframe by those who are familiar with the functions, the language, and the workings of Congress. We had this for twenty-three years through the Office of Technology Assessment, commonly referred to as the OTA. Although the OTA had its detractors, the OTA was a part of the Legislative Branch of the U.S. Government and existed to serve the Congress in one manner: scientific and technical advice for Congress. The OTA was able to elaborate on the broader context of an issue and inform the policy debate with assiduous and objective analysis of the policy consequences of alternative courses of action. The OTA expounded on the various outcomes given particular policy choices, at times extending beyond a mere technical analysis. In 1995 Congress defunded the OTA, and no group or combination of groups has been able to assume OTA's place as the provider of scientific and technical assessment and advice to Congress. To give you an idea, at a rapid glance at the list of the 703 reports produced by the OTA, there are dozens that are still relevant today. "Potential Environmental Impacts of Bioenergy Crop Production," "Innovation and Commercialization of Emerging Technologies," "Retiring Old Cars: Programs to Save Gasoline and Reduce Emissions," "Renewing Our Energy Future," and "Testing in America's Schools: Asking the Right Questions," would all be OTA reports of use today.

Why is this of such importance to Congress? Why do we need specialized, in-house scientific and technical assessments and advice? I can think of three compelling reasons: science and technology pervade almost all issues before us, including many that are not recognized explicitly as technology issues; the language and technologies are specialized and complex, and require translation for Members and their staff; and Members think science and technology are for scientists and technologists, thus avoiding science and technology themselves. Every Member is aware of the social, economic, moral, and political aspects of each of the issues before us. Not so with scientific and technological aspects of the issues before us. Members duck those aspects of the issues, flee them, ignore them, and, perhaps most often, march off oblivious to them.

Decisions made about fisheries, biofuels, agricultural technologies, educational technologies, intellectual property rights, technology transfer, foreign aid, the health care system, and broadband communications, will determine the course of our nation. On the floor we recently have dealt with such issues as voting, missile defense, and net neutrality, each of which has technological components. This week we will vote on the "U.S.-India Nuclear Cooperation Promotion Act," the "Pension Protection Act," and the "Carl D. Perkins Career and Technical Education Improvement Act," each with a technical component—some larger, some smaller, some obvious to Members, many not obvious. In the last few weeks, various committees have held hearings on subjects which contain scientific and technical components. The committees sometimes seem unaware that the subjects contain scientific and technological components. The Science Committee is of least concern; most Members recognize the technological aspects of the issues and get the help necessary. However, this may not be so true for other committees, all of which handle topics with scientific and technical components. For example, the Agriculture Committee recently held a hearing on "Reviewing the Federal Farm Policy;" the Appropriations Committee held a hearing on "the Census;" the Education and the Workforce Committee held a hearing on "NCLB: Can Growth Models Ensure Improved Education for all Students;" the Energy and Commerce Committee held a hearing on "Expanding the Emergency Alert System;" the Homeland Security Committee held a hearing asking "Is Our Nation Prepared for a Public Health Disaster?;" the Small Business Committee held a hearing on "The Effects of the High Cost of Natural Gas on Small Business and Future Energy Technologies;" and the House Administration Committee held a hearing on "Voting System Standards." We lack the scientific and technological analysis of each topic. OTA could have provided this.

We, each day when we cast our vote, are deciding the future of our nation; we are deciding the future for our children, our grandchildren, and our great-grandchildren. We are creating a legacy for which history will hold us accountable. We failed to assimilate some of the culture and knowledge of the Native Americans into our own working schemas when we spread into their lands. I am told that when the Iroquois made decisions for their nation, they were looking ahead to make sure that every decision related to the welfare and well-being of the seventh generation to come, and that was the basis by which decisions were made. They asked themselves "Will this be a benefit to the seventh generation?"

In our technologically advanced, short-focused society, we have lost long-term vision. Investment and decisions concerning science and technology require an understanding of the scientific and technological development process, a sense of responsibility to understand the potential policy outcomes of our decisions, and the understanding that the pay-offs might not come until the next generation.

We need to fill the gaps in our science and technology advice. Technology has been studied extensively by scholars, and the lessons are clear. If we are honest with ourselves, we don't need scholars to tell us we need help. We know it. We need a dedicated, in-house, permanently staffed organization. Each Member of Congress should be able to request a study. The management structure should be designed to deal adequately with the needs of Congress. Political neutrality must be protected. It should also be physically close to Congress. Studies must be useful to the Members of Congress and in time and in language to make them relevant.

Jack Gibbons, referring to the need for an in-house technology assessment organ, sometimes quotes poet Edna St. Vincent Millay:

> "Wisdom enough to leech us of our ill
> Is daily spun, but there exists no loom
> To weave it into fabric. . ."

There is no shortage of information and no shortage of wisdom. We are swamped with experts. We need help in weaving it into policy-relevant fabric.

BIOGRAPHY FOR RUSH HOLT

Rush Holt, 57, is a resident of Hopewell Township, N.J. Born in West Virginia he inherited his interest in politics from his parents. His father was the youngest person ever to be elected to the U.S. Senate, at age 29. His mother served as Secretary of State of West Virginia and was the first woman to have held that position.

Rep. Holt earned his B.A. in Physics from Carleton College in Minnesota and completed his Master's and Ph.D. at NYU. He has held positions as a teacher, Congressional Science Fellow, and arms control expert at the U.S. State Department where he monitored the nuclear programs of countries such as Iraq, Iran, North Korea, and the former Soviet Union. From 1989 until he launched his 1998 congressional campaign, Holt was Assistant Director of the Princeton Plasma Physics Laboratory, the largest research facility of Princeton University and the largest center for research in alternative energy in New Jersey. He has conducted extensive research on alternative energy and has his own patent for a solar energy device. Holt was also a five-time winner of the game show "Jeopardy."

An active Member of Congress and a strong voice for his constituents, Rep. Holt serves on two committees, including the Committee on Education and the Workforce and the House Permanent Select Committee on Intelligence. Holt is the only scientist and only Member from the New Jersey delegation to sit on the Intelligence Committee, where he serves as the Ranking Minority Member on the Intelligence Policy Subcommittee. He is also on temporary leave from a third committee, the House Committee on Resources. Holt is also a member of the bipartisan Commission on Congressional Mailing Standards or the "Franking Commission."

Holt has had the honor to serve on the National Commission on Mathematics and Science Teaching for the 21st Century chaired by former Senator and astronaut John Glenn and currently sits on several caucuses, including those on Renewable Energy, Sustainable Development, Alzheimer's, Diabetes, Biomedical Research, India and Indian-Americans, Hellenic and Greek-American affairs, Farmland Protection, Human Rights, and a Woman's Right to Choose. Rep. Holt is also a member of the New Democrat Coalition.

In only a short time, Rep. Holt has won several significant victories in Washington. He helped secure more than $700 million in new federal funding for science and technology research. He passed an amendment to the Land and Water Conservation Fund providing millions in funding for protecting open space and he was instrumental in adding the lower Delaware River to the National Wild and Scenic River program. He also initiated a federal study to map the gene sequences of all

potential biological weapons to help first-responders and law enforcement react more effectively in the event of biological attack and he commissioned a Congressional investigation into the care at 91 nursing homes in New Jersey following up on reports of negligence.

Rep. Holt has brought significant federal resources to New Jersey. He helped secure $5.6 million for security improvements at the Naval Weapons Station Earle in Monmouth County, $2 million to establish a Land Use Municipal Resource Center to help local communities fight sprawl, and $500,000 for Hunterdon Medical Center to improve its emergency room facilities. Holt has also helped secure more than a hundred million dollars to improve roads, build libraries, and protect historic sites in the five counties he represents.

Throughout New Jersey's 12th district, Rep. Holt has developed a reputation as a tireless advocate for his constituents. He has assisted over five thousand constituents who have contacted his office with inquiries, producing resolutions for problems ranging from Medicare to veterans' health care to immigration. He has also made hundreds of school visits and held dozens of town meetings and forums on topics such as Homeland Security, Alternative Energy, Economic Growth, Prescription Drugs, Student Aid, Privacy, Long-Term Care, and Sprawl.

Rep. Holt has received numerous awards and citations for his work, including the Planned Parenthood Community Service Award, the Biotech Legislator of the Year, and the Science Coalition's Champion of Science award. The magazine *Scientific-American* has also named Holt one of the 50 national "visionaries" contributing to "a brighter technological future."

Rep. Holt is married to Margaret Lancefield, a physician and Medical Director of the Princeton charity care clinic. They have three grown children, Michael, Dejan and Rachel, and six grandchildren, Noah, Niala, Boaz, Varun, Cecile, and Rohan.

DISCUSSION

Chairman BOEHLERT. Thank you very much, Dr. Holt, and you know what? It shows you how well we get along together, Democrat and Republican, New Jersey, New York. I thought that was an outstanding statement, maybe because I agree with it.

But I want to increase your comfort zone somewhat. I am proud to report that this committee and the professional staff has 14 Ph.D.s, 14. That is very impressive, and I am also proud of the fact that we are very active with a number of organizations in town, and you mentioned some of them, AAAS, American Chemical Society, in providing opportunities for Ph.D.s in various scientific disciplines to serve a year's fellowship on the Hill. It is a wonderful program, and so, we are making progress. We are moving in the right direction. That doesn't negate anything that you said in the statement. It just supplements what you said.

Mr. HOLT. If I may, Mr. Chairman.

Chairman BOEHLERT. Sure.

Mr. HOLT. I do want to emphasize that I am not worried about the Science Committee. I mean, I do hope that in future years, it will have leadership as good as it has had in this Congress. However, it is all of those other committees, all of those other Members, that I worry about.

Chairman BOEHLERT. That like to wade into the science pool of activity, and sometimes, well—we won't go into what some of the other committees do or fail to do.

Thank you very much for your outstanding statement. I do appreciate it. Does anyone have any particular questions for our colleague, who has got a very busy schedule?

Mr. ROHRABACHER. Mr. Chairman.

Chairman BOEHLERT. We are going to provide you with a treat now, Dr. Holt. Mr. Rohrabacher.

Mr. ROHRABACHER. I wonder if you could tell me what the budget was for the Office of Technology Assessment per year in the ten years prior to us eliminating it.

Mr. HOLT. At the time it was—I don't have the exact figures, and perhaps, staff can help us here, but when OTA was defunded, it was never deauthorized, when it was defunded in 1995, the operating budget was something in the twenties of millions of dollars a year. I would argue a bargain at any price, but——

Mr. ROHRABACHER. Did you ever request studies done by the Office of Technology Assessment?

Mr. HOLT. I was not a Member of Congress. However, I used many of their studies.

Mr. ROHRABACHER. I was, and I requested things, and they were always late, and often, they got us the material after the debate was already decided, and when the Republican majority came in in 1994, meaning the first year was '95, we were looking for the most inefficient things we could get rid of in Congress, in order to say that we are cutting back here, as well as in the rest of government, and the Members, by majority, found out that—and those of us who had used it—that this was one of the most inefficient operations that we had, and thus, deserved to be cut.

Mr. HOLT. Well——

Mr. ROHRABACHER. Over the objection of others, like the Chairman, et cetera, who didn't see that, but——

Chairman BOEHLERT. Let me point out, Mr.——

Mr. ROHRABACHER. But the majority did believe that.

Chairman BOEHLERT. Mr. Rohrabacher, let me——

Mr. ROHRABACHER. Yes.

Chairman BOEHLERT.—point out that not everyone looked at the picture and saw the same vision. There were a number of us who highly valued the outstanding work of the Office of Technology Assessment, and many of us felt that sometimes, while they were a little bit delinquent in responding to a particular request that you might have advanced, because they were getting so many requests, because it was very obvious that there was a need for the product they were producing, because they were getting so many requests for information. Members like me, who are just—I pride myself in being a pretty darn good generalist, but not a specialist in anything, and you know, I just sort of threw up my hands, and said where do I go for information. And I was not alone. A number of my colleagues did the same thing, and so, I would contend they were sort of overworked, and therefore, that is why they were somewhat delinquent.

Mr. ROHRABACHER. Well, I would agree, Mr. Chairman, that, you know, your worldview sometimes, you know, affects your assessment of, not only the scientific assessment, assessment of how you should spend your money. I mean, I operate under the assumption that bureaucracy is the most effective method ever developed that can turn pure energy into solid waste, and if you couple that, you know, couple great scientists with bureaucracy, and you are expecting to get something out of it more effective than what other bureaucracies produce, I think it really is wishful thinking, and I think, by experience, those of us who voted to eliminate the program, or eliminate funding for it, realized that asking consultants

on the outside to do the same job was actually more cost-effective, and you actually had more control on them than you did once you hired someone as a government employee, and anyway, I would just say that, although we all agree that science is important, and making sure that we try to get nonpartisan assessments is important, certainly we shouldn't give up our analysis of what happens to even scientists when they become bureaucrats, and part of this bureaucracy——

Chairman BOEHLERT. I was——

Mr. HOLT. I would like to address——

Chairman BOEHLERT. Mr. Gordon is most anxious to have an intervention, also, but——

Mr. HOLT. I am not here, and I don't think the witnesses are here, to re-fight old battles. I do think that we have now 10 years of data, and it is pretty clear to me, since I have been here most of those ten years now, that we have not gotten the kind of technological assessment and advice that we told ourselves we would be able to get through other methods. So, it hasn't worked over the last 10 years. Now——

Mr. ROHRABACHER. Could you give me some examples of that?

Mr. HOLT. There may be some——

Mr. ROHRABACHER. Well, a couple examples.

Mr. HOLT. Sure. How about, let me see, do I have today's——

Mr. ROHRABACHER. Well, we have got global warming advice coming out our ears, of course, by everyone who is being paid to give us that advice, but go ahead.

Mr. HOLT. Yeah. Well, I will illustrate this in a way.

Chairman BOEHLERT. I told you it would be an interesting intervention.

Mr. HOLT. Not to harp on OTA, but to make the point that we still have a crying need for policy-relevant, I would argue in-house, but at least policy-relevant technological assessment and advice, let me also address your point about the timeliness of the reports we got from OTA.

We got reports from OTA on adverse reaction to vaccines, computer software and intellectual property, saving energy in U.S. transportation, retiring old cars, export controls and nonproliferation policy, electronic surveillance in a digital age. Let me suggest to the gentleman that those reports were so timely that they are still useful today. Now, maybe you didn't get it on the week that you wanted it, but these are reports that are still useful today.

Mr. ROHRABACHER. Some of those reports may have been given to us after we had the vote in Congress on the issue.

Mr. HOLT. But my point——

Mr. ROHRABACHER. That is the important point.

Mr. HOLT. My point to the gentleman is we have not yet resolved the issues of adverse reactions to vaccines, intellectual property and computer software, saving energy in U.S. transportation, retiring old cars, export controls and nonproliferation policy, electronic surveillance in a digital age. We still need those reports, and in fact, we are still using them.

Mr. ROHRABACHER. Thank you.

Chairman BOEHLERT. Mr. Gordon.

Mr. GORDON. Just briefly, I know, I disagree with my friend from California, Mr. Rohrabacher, but I don't disagree with his sincerity. I know that he is sincere in these issues, so I am not going to try to get into an argument, because we are not going to change anybody's mind.

But let me just again point out that if there was a problem with timeliness at OTA earlier, the problem, I think, as the Chairman pointed out, was it was underfunded and over-requested, which demonstrates, you know, it was the wrong reaction. We should have increased the funding, and I think by having good information, we would have saved the country money.

And I particularly have to disagree that we want to—with Mr. Rohrabacher's announcement that we need to contract these things out, so we would have more control over them. We don't want to have more control over them. We want to have good, you know, solid scientific information.

Again, he is sincere, Mr. Holt is sincere, I think. Nobody would be at this stimulating meeting today, if they weren't sincere.

Mr. ROHRABACHER. Well, would the gentleman yield for just one moment.

Mr. GORDON. And so——

Mr. ROHRABACHER. Would the gentleman yield?

Mr. GORDON. Certainly, certainly.

Mr. ROHRABACHER. What I have been told is the budget over a ten year period was $200 million, and they had two hundred employees in, you know, the Office, and that is an awful lot of consulting work that we could have had done for $200 million——

Mr. GORDON. Well, that is $20 million a year.

Mr. HOLT. Yes, it was about $20 million a year in those years' dollars, at its peak, 143 employees, I am told.

Chairman BOEHLERT. Thanks. Anyone else? All right. Thank you very much, Dr. Holt.

We could have a spirited, over a cup of coffee, discussion with Mr. Rohrabacher and our colleagues on the Committee, because for the benefit of the audience, this is the type of conversations we oftentimes will have on the floor, and Dana Rohrabacher and I don't always see eye to eye, but we always agree to have a nice friendly little chat about such things as global climate change, which he thinks is a figment of my imagination, but thank you, Dr. Holt, and thank you, Mr. Rohrabacher, for the intervention.

Now, our second panel, and here is what I would like to do. I ask unanimous consent that Dr. Holt be permitted to sit with the Committee, and participate in the questioning. Without objection, so ordered.

Now, panel number two. Dr. Jon Peha, Department of Engineering and Public Policy, Carnegie Mellon University. Dr. Al Teich, Director, AAAS Directorate for Science and Policy Programs, American Association for the Advancement of Science. Dr. Peter Blair, Executive Director, Division on Engineering and Physical Sciences, the National Research Council, and Dr. Catherine T. Hunt, the Leader of Technology Partnerships, Rohm and Haas Company.

Panelists, thank you so much for being facilitators for the Committee, information sources. We really appreciate your preparing for this hearing, and providing testimony. Your complete state-

ments will be included in the record at this juncture. We would ask that you try to summarize them, so that we could have the benefit of a dialogue, conversations with Congress. Thanks so much.

Dr. Peha, you are first.

Panel II:

STATEMENT OF DR. JON M. PEHA, PROFESSOR, DEPARTMENTS OF ENGINEERING AND PUBLIC POLICY AND ELECTRICAL AND COMPUTER ENGINEERING, CARNEGIE MELLON UNIVERSITY

Dr. PEHA. So much for my mastery of technology.

Good morning. My name is Jon Peha. I am a Professor of Electrical Engineering and Public Policy at Carnegie Mellon University, and Associate Director for the Center for Wireless and Broadband Networking.

There may be no institution on Earth inundated with more unsolicited advice than Congress, so it should sound strange for me to say that Congress is not getting information that it needs, but that is precisely what I have come here to say.

You can master many complex issues by filling a table like this one with people who have competing interests, and watching them argue their points of view. Unfortunately, this approach breaks down when the issue is highly technical. For example, in the current debate on network neutrality and the Internet, I have watched advocates from all sides advance their agenda by giving misleading simplifications of how the Internet actually works and what neutrality might mean. From that, I don't see how any non-expert could tell what the issue is about, much less what to do about it. I couldn't separate substance from rhetoric until I did my own assessment, rooted in the technology of the Internet.

With this kind of issue, Congress needs balanced analysis that identifies possible policy options, and pros and cons of each, without telling Congress what to do. Armed with this basic information, Members can listen to stakeholders and make their own decisions. But who can provide this basic background?

Congress can turn to CRS, CBO, or GAO, but this type of analysis is not within their traditional mission. They would have to build the capability. Congress has the National Academies, which can bring together leading experts who will collectively recommend a course of action. Such studies are valuable, but Congress often needs someone to frame the issue, not recommend a solution.

There are university faculties that try to advise Congress, and I hope we are useful. I spend a lot of time at this. But faculty are removed from Capitol Hill. We may not produce reports on the issues of greatest importance to Congress at the time of greatest need, or in the format that is useful to Congress, and thus far, Congress has not created mechanisms to help us do so. Moreover, without investigation, you can't know the professor is advancing a balanced assessment or personal agenda.

So, in short, there are information sources that produce thorough, accurate, and balanced reports, and sources that are attuned to the needs of the Congress, but there is a shortage of sources that

do both, and Congress should fill this gap with a new program, either as a new agency, or inside an existing one.

Now, there are many ways to do this. I will focus here on four important qualities of an effective program. It should be responsive, credible, impartial, and independent.

So first, the organization must be responsive to the needs of Congress. To ensure this, there should be a core group of professionals who are ultimately responsible for all products, who interact regularly with Members and their staffs, and for whom Congress is the principal client and funding source.

Second, the organization should have credibility in technical communities, even from stakeholders who don't like the latest report. Since no one organization can have credible expertise in all areas, this organization must be able to draw on leading scientists and engineers as needed, and leaders of the organization should have strong professional credentials that will earn respect outside the Beltway.

Third, the organization must be impartial and appear to be impartial. To achieve this, it must develop procedures that include careful outside review. It must have leaders who understand balanced technology assessments and will make appropriate use of dissenting views, and it must have strong bipartisan, bicameral oversight from Congress, to ensure that the interests of all Members are well served.

Finally, the organization must have the independence to release controversial studies without risk of elimination. The method of deciding which studies will be completed must be carefully designed to reflect the needs of both the majority and minority in Congress, and Congress should allocate budgets years in advance, so the organization can ride out one or two very controversial reports.

An organization with these qualities would help all Members of Congress. It would be an insurance policy against unintended consequences from complex legislation, and it would earn the praise of scientific professional societies and their members.

I commend the Committee for considering this issue, and I thank you for hearing my opinions.

[The prepared statement of Dr. Peha follows:]

PREPARED STATEMENT OF JON M. PEHA

Good morning Mr. Chairman, and Members of the Committee.

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There may be no institution on Earth that is inundated with more unsolicited advice than Congress, so it could sound strange for me to say that Congress is not getting information that it needs, but that is precisely what I've come here to say.

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and make their own decisions about which policy is best overall. But who can provide this background?

Congress can always turn to CRS, CBO, or GAO, but this type of analysis is not within their traditional mission. They would have to build the capability. Congress also has the National Academies, which can bring together leading experts who will collectively recommend a course of action. Such studies are valuable, but the process can be slow and expensive, and Congress often needs someone to frame the issue, rather than recommend a solution.

Some university faculty try to advise Congress, and I hope we are useful. However, faculty are removed from Capitol Hill. We may not produce reports on the issues of greatest importance to Congress, at the time of greatest need in Congress, or in a form that can be easily used by Congress. Thus far, Congress has not created mechanisms that would help us do so. Moreover, without investigation, you cannot know if a professor is offering a balanced assessment or advancing a private agenda.

In short, there are information sources that produce thorough, accurate, and balanced reports, and sources that are attuned to the needs of Congress, but there is a shortage of sources that do both. Congress should fill this gap with a new program, either as a new agency or inside an existing one.

There are many ways to do this. I will focus here on four important characteristics of an effective program It must be *responsive, credible, impartial,* and *independent.*

First, the organization must be responsive to the needs of Congress. To insure this, there should be a core group of professionals who are ultimately responsible for all products, who interact regularly with Members and their staffs, and for whom Congress is the principal client and funding source, as with GAO or CBO.

Second, the organization must have credibility in technical communities, even from stakeholders who are not thrilled with any given report. Since no one organization can have credible expertise in all areas, this organization must be able to draw on the country's leading scientists and engineers whenever needed. Moreover, the leaders of this organization should have strong professional credentials that will earn respect outside the beltway.

Third, the organization must be impartial, and appear to be impartial. To achieve this, it must develop procedures that include careful outside review, both when framing the issues and when vetting the results. This organization must have leaders who understand what balanced technology assessments look like, and will make appropriate use of dissenting views. There must also be strong bipartisan bicameral oversight from Congress, to insure that the interests of *all* Members of Congress are well served.

Finally, the organization must have the independence to release controversial studies without risk of elimination. The method of deciding which studies will be completed must be carefully designed to reflect the needs of both the majority and minority in Congress. Moreover, Congress should allocate budgets years in advance, so the organization can ride out one or two reports that offend a powerful group.

An organization with these qualities would help all Members of Congress. It would be an insurance policy against unintended consequences from legislation involving science or technology. It would also earn praise from many scientific professional societies, and their members.

I commend the Committee for considering this important issue, and I thank you for inviting me to express my views.

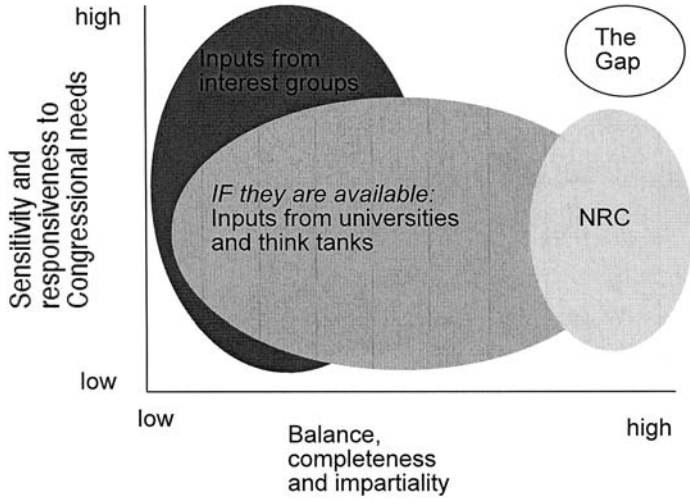

Figure 13-2 from *Science and Technology Advice for Congress,* M. G. Morgan and J. M. Peha, RFF Press, 2003.

Appendix 1: Published in *Renewable Resources Journal,* Vol. 24, No. 2, pp. 19–23

Science and Technology Advice for Congress: Past, Present, and Future

JON M. PEHA

Legislation Blowing in the Wind

With visions of Hurricane Katrina dancing in their heads, many Members of Congress wanted to immediately push some kind of legislation that would save American lives in future disasters, but how? Disaster response is a complex matter. Katrina, like any problem that dominates the American news, produces a deluge of proposed "quick fixes" to be evaluated by Congress. When proposals involve science or technology, this can be difficult.

One problem Congress could address in the aftermath of Katrina is the wireless communications systems used by firefighters, paramedics, National Guardsmen, and other emergency responders. Search and rescue efforts often were crippled by failures in these systems. Some will now push for grants to local governments to improve technical "inter-operability," i.e., the ability of responders in one agency to communicate with responders in another agency. After all, inter-operability failures cost lives on 9/11 [1], after Katrina, and on too many other occasions [2]. Others will push to take spectrum away from television broadcasters, because a portion of this spectrum would go to public safety. After all, there is good reason to fear that a dangerous shortage of public safety spectrum is coming [3]. However, the decisions are not simple. One company after another will tell Congressional staff of their alleged "solution" to inter-operability problems, if government agencies would only purchase their products. Other companies will describe how the release of television spectrum in the manner they propose would be the salvation of public safety, and by coincidence, the proposed change also will affect their commercial systems in subtle but important ways. It is hard for someone without technical expertise to make sense of all these claims. Worse yet, changes may have side effects. Some plans intended to make more spectrum available to public safety would accidentally create new inter-operability problems, and some plans intended to improve inter-operability would accidentally exacerbate a spectrum shortage [4,21]. Moreover, in preparing communications systems for the next hurricane, some issues could be even more important than either inter-operability or a potential spectrum shortage, but no one successfully has brought these issues to the attention of Congress. There may be no one with sufficient incentive to do so.

There is nothing unique about this drama. This year, almost every committee in Congress will face one or more issues that are similarly hard to disentangle without expertise in some area of science or technology. This includes issues related to energy, the environment, health care, food safety, national defense, homeland security, space exploration, intellectual property, transportation, and telecommunications, just to name a few. The majority of these typically are not labeled as "science issues," and most do not go through the Science Committee.

Plenty of Input, Not Enough Clarity

Congress relies primarily on adversarial procedures that are honed for equitably setting priorities, in contrast with the very different forums of scientists, which are honed for advancing knowledge [5,6]. Congress must answer questions like 'is it more important to reduce the cost of automobiles or to reduce gasoline consumption?' and 'is it better to increase taxes or to cut programs?' Stakeholders from all sides of a debate make their case. Members of Congress, acting as representatives of their constituents rather than experts in any narrow discipline, then adopt a position based on their own values and priorities. Debates continue until consensus emerges for a compromise between competing interests. All of this works well if Members of Congress have a clear understanding of the issues and tradeoffs. Understanding can be extremely difficult when issues are rooted in science or technology. Indeed, it can be hard for someone with no technical expertise to ask the right questions. Thus, as shown by the above example of communications systems for public safety, Congress may need assistance in framing and prioritizing the fundamental problems, identifying the legislative options, assessing advantages and disadvantages of each option, and calling attention to any unintended side effects. With this information, Members of Congress of all political persuasions can apply their own values, and make informed decisions. Unfortunately, Congress has no reliable source for this kind of assistance on technical issues.

This does not mean Congress has no information. Indeed, Capitol Hill is overflowing with lobbyists who are prepared to tell Members of Congress how to vote and why. While input from stakeholders and their representatives is essential, it clearly is no substitute for the kind of impartial assessment described above. Members of Congress also can turn to a cadre of dedicated and intelligent staff. However, given the tremendous range of issues that Congress must address, most Congressional staff are generalists whose primary expertise is the legislative process, rather than any scientific discipline. Alternatively, Members of Congress can seek advice from one of their support organizations: the Congressional Research Service (CRS), the Congressional Budget Office (CBO), or the Government Accountability Office (GAO). While each of these organizations plays an important role, and all are in a good position to understand Congressional needs, the detailed assessment of technical issues simply is not part of their historical mission, so they traditionally have not built staff expertise, institutional mechanisms, or credibility in this area [7]. Of course, Congress may be changing that tradition—an option that will be discussed later.

Another important source of information on issues related to science and technology is the executive branch agencies, many of which have significant expertise. However, the U.S. system is based on checks and balances, and Congress is obligated to oversee the activities of the executive branch. Meaningful oversight is impossible without independent expertise. For example, Congress cannot oversee the Nation's finances if they depended entirely on the White House for analysis, which is why Congress has a Congressional Budget Office that is completely independent of the White House Office of Management and Budget. Unfortunately, on matters related to science and technology, Congress has no comparable support.

There still are more sources of information outside of government. These tend to be inappropriate for different reasons. The National Academies sometimes are an excellent resource for Congress [8[, but for a different purpose. The National Academies generally attempt to bring diverse experts together to produce a consensus recommendation about what Congress should do. In many cases, Members of Congress do not want to be told what to do. Instead, they want a trustworthy assessment of their options, with the pros and cons of each, so they can make up their own minds. Universities and research institutes also produce valuable work on some important issues, but it rarely is generated at a time when Congress most needs it, or in a format that the overworked generalists of Congress can readily understand and apply. Moreover, Members of Congress must be suspicious that the authors of any externally produced report have an undisclosed agenda.

In short, there is a fundamental gap in the information available to Congress. There is no consistent source of in-depth assessments that are balanced, complete, impartial, and produced at a time and in a format that is sensitive to the specific needs of Congress [9]. CRS reports are sensitive to Congressional needs and are designed to be impartial, but, by design, are limited in scope and depth. Partisan input also can be sensitive to the needs of Congress, but it is never impartial. Other information produced outside of Congress tends to be far less sensitive to Congressional needs, and the majority of it advocates for particular positions rather than merely providing a baseline assessment.

The Controversial History of Technology Assessment

There have been notable attempts to fill this gap. The flagship solution was the Office of Technology Assessment (OTA), a stand-alone organization that worked specifically for Congress, like CRS, CBO, and GAO. OTA produced roughly 750 reports during its 23-year lifespan, many of which were rigorous, respected, and widely cited by both supporters and opponents of the controversial measures that these reports addressed. Using OTA as a model, many nations have created similar organizations to advise their national legislatures [10]. While OTA had its supporters, it also had some severe critics, and this would ultimately be the organization's undoing. When Republicans took control of the House of Representatives in 1995 after four decades in the minority, they eliminated OTA.

Some of the reasons for eliminating OTA had little to do with its effectiveness. While the Republicans were in the minority, they often had called for the elimination of various government programs and agencies. When they became the majority party in the House, they were under great pressure to follow though on these promises, but it was not easy to eliminate big targets like the Department of Education. Ultimately, they would succeed in eliminating exactly one agency—OTA—giving it great symbolic importance.

Nevertheless, the debate over OTA was not all symbolism. Some Members of Congress raised noteworthy concerns. The most serious allegation was bias. It is not surprising that the party in the minority (before 1995) would raise concerns about

bias, given that the other party had dominated Congress throughout OTA's existence. For example, some conservatives claimed bias in a series of OTA reports that questioned the technical feasibility of the Strategic Defense Initiative (SDI) (dubbed "Star Wars" in the press) [11–14]. SDI was intended to shield America from incoming missiles. To the horror of then-President Ronald Reagan and his supporters in Congress, OTA concluded that the SDI vision of protecting all Americans from Soviet missiles was "impossible to achieve." [12]

Two decades later, the debate continues over whether OTA was biased, but this debate is largely irrelevant. Regardless of whether the bias concern was rooted in reality, appearance, or fabrication, the lessons are the same. Bias or the appearance of bias can be devastating. An organization designed to serve Congress must be both responsive and useful to the minority, as well as the majority. Representatives of both parties and both houses must provide careful oversight, so that credit or blame for the organization's professionalism is shared by all.

The most likely way for bias to arise is in the selection of issues to be investigated. Consequently, both parties and both houses must have significant say in this selection. Shared oversight can prevent a pattern of bias across many issues, but if an unbiased organization is doing its job well, there still will be individual reports that anger one group within Congress. As long as there was no bias in the selection of topics, all reports will not displease the same group. Consequently, the organization must be constructed in such a way that the furor over any one or two controversial issues is likely to die down before angry partisans can eliminate the agency. For example, funding and staff levels might be fixed four years ahead of time, instead of just one year.

Probably the most frequent criticism of OTA from supporters and detractors alike is that it was too slow; some studies took so long that important decisions already were made when the relevant reports were released. Many have argued that any future organization must be faster. This may be the case, but there are more important lessons here. Good work takes time, particularly if Congress is expecting a broad scope, and extensive depth. However, this is not always the case. Sometimes a Congressional Committee happily will accept a narrow scope or a significant amount of recycled content, if the report is available quickly. The most important lessons here are that an organization providing technology assessments must offer Congress a wider range of services with varying durations and scopes, and that it must be part of this organization's culture to listen carefully to its client (Congress) to understand the client's preferences for any given project.

A New Era for Technology Assessment

In June 2001, six years after OTA's demise, Carnegie Mellon University organized a workshop in Washington, D.C. on the state of science and technology information in Congress. The workshop drew leaders from both the scientific community and from Congress. Speakers from Congress included Representatives Sherwood Boehlert (R–NY), Vernon Ehlers (R–MI), Rush Holt (D–NJ), and Amo Houghton (R–NY). There was remarkably strong consensus that Congress needed new institutional support to provide advice on issues related to science and technology, although opinions differed on the ideal form of this support. Some preferred a return to the OTA model, and others preferred something quite different.

Six distinct approaches are discussed in detail in *Science and Technology Advice for Congress* [15], a book produced by many workshop participants. Two difficult questions divide many of these models: (1) should this technology assessment capability reside in an existing organization or a new organization, and (2) should its staff work directly for Congress or should there be institutional separation?

The problem with creating a new technology assessment capability and placing it in an existing organization, whether it is CRS or the National Academies, is that these organizations already have their own missions and their own cultures, which are not perfectly compatible with the technology assessment process. This clash can make it more difficult to do high-quality technology assessments. Moreover, if these assessments are viewed internally as a diversion from the organization's real mission, there is a danger that some important resources (e.g., staff, funding) will be directed elsewhere when budgets are tight. On the other hand, if this new program is a division of an existing organization, there may be more opportunities to share scarce resources and expertise. Moreover, judging from the OTA experience, a standalone organization may be more vulnerable to complete elimination during heated controversies.

With regard to the second question of "distance" from Congress, some advocated that technology assessments be conducted within an organization that answers directly to Congress (i.e., GAO, CRS, CBO), or a new organization that is similarly constructed. Others wanted an organization (new or existing) that operates under

contract to Congress, and perhaps to other clients as well, as the National Academies do today. The former would encourage staff to be more sensitive to the needs of Congress. It also could afford them less protection when bringing news that Members of Congress do not want to hear. Moreover, the staff size of a Congressional organization is always limited, making it difficult for this organization to have expertise in every topic of potential interest to Congress. By contracting work to outside organizations, talent can be drawn from a much larger pool. This issue becomes particularly important if the technology assessment effort is relatively small.

Given these tradeoffs, my proposal would create a hybrid, in which a small dedicated staff work on Capitol Hill directly for Congress [16]. Their job is to understand the needs of Congress, and to insure that all reports in their final form meet those requirements. However, much of the assessment work would be done by a collection of outside organizations, each of which would be certified every few years for competence, professionalism, and impartiality.

After the workshop, Senator Jeff Bingaman (D–NM) proposed the creation of a small pilot program in technology assessment. Thanks to bipartisan support in both the House and Senate, the pilot received $500,000 of funding in the 2002 budget. Work began in March 2002, and GAO's first assessment on biometric technology for border security came out in November 2002 [17]. This was remarkably fast turnaround, especially given that GAO had no institutional experience with this kind of analysis. GAO also invited an external evaluation of their work from outside experts [18], which demonstrates seriousness about quality. (Most agencies avoid criticism rather than seek it). Other GAO technology assessments have followed [19,20].)

Early results are quite encouraging. Experience to date shows that a technology assessment program operating within GAO is capable of producing balanced, timely, and relevant reports containing a range of useful information on important issues before Congress. Not surprisingly, early results also show that improvement is possible and desirable, in large part because technology assessments differ substantially from the traditional GAO studies in intent, content, and process. Thus, for example, GAO must learn new methods of soliciting input from outside experts, framing a technology assessment, and subjecting work to fast but effective peer review. If Congress keeps funding this pilot, it is likely that GAO will continue to improve with experience.

This small pilot will do some useful work, and foreshadow the effectiveness of a program within GAO before making longer-term decisions. However, the GAO pilot cannot succeed in the long run if it remains a mere pilot. A technology assessment program must develop or recruit a staff that has strong credentials to impress both the scientific and Congressional communities, and significant expertise in science or technology, in communicating with Congress, and in technology assessment. Attracting, developing, and retaining outstanding people with these diverse skills will not be easy for a program that could abruptly cease to exist with little warning.

Worse yet, should a technology assessment ever produce news that is unwelcome to any powerful group within Congress, there is little to protect the program from termination. Since management within GAO knows this, they might be tempted to avoid controversial issues, or worse yet, to dilute the conclusions of experts and staff members. If they succumb to this temptation, the program will be of limited effectiveness, and if they do not, the program will not survive for long.

Conclusion

When issues are rooted in science or technology, Members of Congress often need assistance in framing issues, identifying legislative options, and assessing all the pros and cons of each option, so they can make informed decisions that are consistent with their own values and priorities. Today, Congress has no reliable, impartial source available to provide detailed analysis of this type, with the possible exception of a limited pilot effort within GAO. It is time for Congress to move beyond pilots, and to establish a permanent technology assessment capability. When creating a permanent solution, the greatest challenges will be to ensure that this new technology assessment program has careful and balanced bipartisan and bicameral oversight, and that its staff and funding levels will remain stable, even through heated controversies and budget crises. Ideally, they should receive sufficient resources to offer a significant amount of support for Congress, but stability is more important than size.

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Appendix 2

For further discussion, please see the following book

Science and Technology Advice for Congress,

M.G. MORGAN AND J.M. PEHA,
RFF PRESS, WASHINGTON, DC, 2003.

PUBLISHER'S SYNOPSIS:

The elimination of the Office of Technology Assessment (OTA) in 1995 came during a storm of budget cutting and partisan conflict. Operationally, it left Congress without an institutional arrangement to bring expert scientific and technological advice into the process of legislative decision-making. This deficiency has become increasingly critical, as more and more of the decisions faced by Congress and society require judgments based on highly specialized technical information.

Offering perspectives from scholars and scientists with diverse academic backgrounds and extensive experience within the policy process, *Science and Technology Advice for Congress* breaks from the politics of the OTA and its contentious aftermath. Granger Morgan and Jon Peha begin with an overview of the use of technical information in framing policy issues, crafting legislation, and the overall process of governing. They note how, as non-experts, legislators must make decisions in the face of scientific uncertainty and competing scientific claims from stakeholders. The contributors continue with a discussion of why OTA was created. They draw lessons from OTA's demise, and compare the use of science and technological information in Europe with the United States.

The second part of the book responds to requests from congressional leaders for practical solutions. Among the options discussed are expanded functions within existing agencies such as the General Accounting or Congressional Budget Offices; an independent, NGO-administrated analysis group; and a dedicated successor to OTA within Congress. The models emphasize flexibility—and the need to make political feasibility a core component of design.

BIOGRAPHY OF JON M. PEHA

Jon M. Peha is Associate Director of the Center for Wireless and Broadband Networking at Carnegie Mellon University, and a Professor in the Department of Engineering and Public Policy and the Department of Electrical and Computer Engineering. He has addressed telecom and e-commerce issues on legislative staff in the House and Senate, and helped launch a U.S. Government interagency program to assist developing countries with information infrastructure. He has also served as Chief Technical Officer of several high-tech start-ups, and as a member of technical staff at SRI International, AT&T Bell Laboratories, and Microsoft. Dr. Peha's research spans technical and policy issues of information networks. This has included broadband Internet, wireless networks, video and voice over IP (VOIP), communications systems for first responders for public safety and homeland security, spectrum management, universal service, secure systems for financial transactions over the Internet, e-commerce taxation and privacy, and network security. He holds a Ph.D. in electrical engineering from Stanford.

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July 18, 2006

The Honorable Sherwood Boehlert
Chairman, Science Committee
2320 Rayburn Office Building
Washington, DC 20515

Dear Congressman Boehlert:

Thank you for the invitation to testify before the Committee on Science of the U.S. House of Representatives on May 25th for the hearing entitled "Scientific and Technical Assessment and Advice for the U.S. Congress.." In accordance with the Rules Governing Testimony, this letter serves as formal notice of the federal funding I currently receive related to the hearing topic.

I received no federal funding directly supporting the subject matter on which I will testify, in the current fiscal year or either of the two proceeding fiscal years.

Sincerely,

Jon M. Peha
Professor
Carnegie Mellon University

Chairman BOEHLERT. Thank you very much, Dr. Peha. Let me point out that sometimes, advice and information are two different things entirely.

Dr. Teich.

STATEMENT OF DR. ALBERT H. TEICH, DIRECTOR OF SCIENCE AND POLICY PROGRAMS, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Dr. TEICH. Mr. Chairman, Mr. Gordon, Members of the Committee, thank you for the opportunity to appear here this morning on behalf of AAAS.

AAAS, as you may know, is the world's largest multi-disciplinary scientific association. We were founded in 1848, and today represent roughly 10 million individuals who are members in our affiliated societies. We are also the publisher of the journal *Science.*

Congress today is addressing an increasing number of complex scientific issues. Last week alone, the House and its committees addressed, among other topics, stem cell research, climate change science, voting technology, fuel cells, and agricultural policy.

Few Members of Congress, with the notable exception of several Members of this committee, and relatively few Congressional staff,

at least outside of this committee, have backgrounds in science. Do adequate resources exist for Congress to address these kinds of issues? From our perspective, the answer is no. Information is abundant, but objective, timely, policy-relevant analyses, which is what Congress really needs, are in short supply.

The increased use of technology and the Internet have revolutionized the way in which people and organizations communicate with elected officials. A recent study found that Congress received four times more communications in 2004 than it did in 1995. An average Congressional staffer, of which there are over 10,000, receives 200 emails a day from advocacy groups, constituents, and colleagues, and I suppose that doesn't even include advertisements for Viagra and other similar emails.

How can a Member of Congress, as busy as he or she is, digest this enormous amount of information, and separate the wheat from the chaff? Many scientific assessments are conducted or funded by entities that have a financial or political interest in the issue at hand, and funding from such groups is often perceived to affect the study's findings. Conflicting reports from groups with different viewpoints can make it difficult to determine where the scientific consensus lies, particularly for those not deeply familiar with the scientific process.

Congressional support agencies, such as the Government Accountability Office, the Congressional Budget Office, and the Congressional Research Service, play an important role. Nonpartisanship, objectivity, and responsiveness to Members' requests make them valuable resources. Each one, however, has limitations when it comes to providing scientific and technical policy analyses, as I indicate in my written statement.

Though they are not Congressional support agencies, the National Academies and the National Research Council respond to approximately 10 to 20 Congressional requests for studies each year. Though reports can be completed quickly sometimes, often, the process takes twelve to eighteen months. These authoritative studies by distinguished scientific experts therefore tend to be most useful for in-depth treatment of long-term issues.

Other large-scale assessments, including international projects, such as the Millennium Ecosystem Assessment, the executive branch research efforts, such as the Climate Change Science Program, also provide in-depth studies, but again, not on a time scale that is consistent with the needs of Congress.

One resource available to Congress, as mentioned earlier, is the Congressional Science Fellows program. Begun by AAAS in 1973, the program today provides an opportunity for approximately 35 Ph.D. level scientists and engineers to work as professional staff in Congressional offices for a year. Fellows' stipends are paid by scientific societies, making them a free source of expertise for Members. Many Fellows catch Potomac Fever and remain in Washington as permanent Congressional staff, providing a scientific perspective on policy issues. Nevertheless, the relatively small number of Fellows means that the percentage of staff with scientific backgrounds remains low.

In recent years, universities and scientific societies, including AAAS, have expanded efforts to bring objective scientific informa-

tion to Congress through reports on policy relevant topics and scientific briefings. These activities are often limited by funding. In addition, scientists are often cautious about providing policy analyses on scientific issues, sticking instead to providing data, limiting their ability to inform decisions in a meaningful way.

To sum up, information is not in short supply on Capitol Hill, as you, Mr. Chairman, indicated, but information is not knowledge. Credible sources are needed to provide timely analysis and synthesis of scientific and technical information as a foundation for Congressional decisions.

These concerns are not new, as Mr. Gordon mentioned in his statement. Back in 1970, and in fact, previous to that even, at least in 1970, a study of Congress found that it lacked "independent sources of scientific and technical advice." This realization led to a number of important organizational innovations. The even greater role of science and technology in today's society demands that Congress seek innovative methods suited to 21st Century needs to obtain objective, timely, policy-relevant analyses, that is, knowledge that Members can use.

AAAS and the scientific community stand ready to help in this vital endeavor. Thank you very much for allowing me to express my views.

[The prepared statement of Dr. Teich follows:]

PREPARED STATEMENT OF ALBERT H. TEICH

Thank you for the opportunity to appear before you today on behalf of the American Association for the Advancement of Science (AAAS) to discuss scientific and technical advice for Congress. AAAS is the world's largest multi-disciplinary scientific society and publisher of the journal *Science.* AAAS was founded in 1848, and represents roughly 10 million individuals through its members, affiliated societies and academies of science.

Congress is increasingly addressing complex scientific issues. Last week alone, the House and its committees addressed—among other topics—stem cell research, climate change science, voting technology, fuel cells, and agricultural policy. Over the past year, the list expands to include intellectual property, avian influenza, bioterrorism threats, research priorities in aeronautics, and ocean resource management.

Few Members of Congress, with the notable exception of several Members of this committee, and relatively few congressional staff, have backgrounds in science. Do adequate resources exist for Congress to address these issues? From our perspective, the answer is no. Information is abundant, but objective, timely, policy-relevant analyses are in short supply.

The increased use of technology and the Internet have revolutionized the way in which people and organizations communicate with elected officials. A recent study found that Congress received four times more communications in 2004 than it did in 1995. Virtually all of this increase is from Internet-based communication. The average congressional staffer (of which there are over 10,000) receives 200 e-mails each day from advocacy groups, constituents, and colleagues.[1]

How can a Member of Congress, as busy as he or she is, digest this enormous amount of information, and assess its validity? Many scientific assessments are conducted or funded by entities that have a financial or political interest in the issue at hand. Funding from such groups or organizations is often perceived to affect the study's findings. Conflicting reports from groups with different viewpoints can make it difficult to determine the scientific consensus, particularly for those not deeply familiar with the nature of science, the peer-review process, the definitions of scientific consensus, and principles of uncertainty.

Furthermore, a key challenge for members and their staffs is to use the information and assistance provided by interest groups without becoming bound to their agendas. In the words of one observer, "interest groups usually have their own ideas

[1] Fitch, Brad and Nicole Griffin, *Communicating With Congress: How Capitol Hill Is Coping With the Surge in Citizen Advocacy,* Congressional Management Foundation, 2005.

about proper allocation, and they seldom coincide with Congressmen's predilections."[2]

Nonpartisanship, objectivity, and responsiveness to Members' requests make Congressional support agencies, such as the Government Accountability Office (GAO), the Congressional Budget Office (CBO), and the Congressional Research Service (CRS), valuable resources, though they are not solely dedicated to science and technology. One explanation of Members' overall positive appraisal for the agencies may lie in an observation by Davidson and Oleszek:

> "Unlike committee or personal aides, these agencies operate under strict rules of nonpartisanship and objectivity. Staffed with experts, they provide Congress with analytical talent matching that in executive agencies, universities, or specialized groups."[3]

CRS reflects its base in the Library of Congress by providing quick responses to thousands of congressional requests annually for factual information, as well as providing policy research and analysis. Its reports are useful, but its ability to provide synthesis is limited. Though it has the ability to conduct scientific and technological assessments, GAO's work reflects its traditional major focus—eliminating waste and fraud and improving program performance. At its current staffing levels, GAO can only complete one to three technology studies per year.[4]

Though they are not congressional support agencies, the National Academies and National Research Council respond to approximately 10–20 requests for studies from Congress each year. Though reports can sometimes be completed quickly, the process generally takes 12–18 months. These authoritative studies that involve distinguished scientific experts writing peer-reviewed reports tend to be most useful for in-depth treatment of long-term issues.

Other large-scale assessments, including international projects such as the Millennium Ecosystem Assessment and Intergovernmental Panel on Climate Change (IPCC), provide in-depth assessments of the current state of knowledge on broad topics. The IPCC aims to provide information that is policy relevant but not policy prescriptive. Similarly, ongoing executive branch research efforts such as the Climate Change Science Program use experts to determine the scientific consensus on key issues. However, these large-scale projects are seldom conducted on a time scale that is consistent with the needs of Congress.

One resource available to Congress is the Congressional Science Fellows program. Begun in 1973 by a group of scientific and engineering societies led by AAAS, this program provides an opportunity for approximately 35 Ph.D.-level scientists and engineers to work as professional staff in congressional offices for a year. Fellows' stipends are paid by scientific societies, making them a free source of expertise for Members. Many Fellows catch "Potomac Fever" and remain in Washington as full-time congressional staff, continuing to provide a scientific perspective on policy issues.

Over the years, many Members of Congress have indicated how valuable they find the program. For example Rep. John Peterson (R–PA) noted that "Congressional Fellows have played a key role on my staff. . .and the knowledge and expertise which they bring to the table has been a tremendous asset when dealing with science and technology issues." Senator Harry Reid (D–NV) added that Fellows in his office "have made critical contributions to a wide range of legislative and oversight projects, including health, environmental, educational, technological, economic and security issues." Nevertheless, the relatively small number of fellows means that the percentage of staff with a scientific background remains low.

Universities and scientific societies, including AAAS, have expanded efforts to bring accurate scientific information to Congress through reports on policy-relevant topics, position statements, and scientific briefings. These activities are often limited by funding. In addition, scientists are often cautious about providing policy analysis on scientific issues, sticking instead to providing scientific data, limiting their ability to inform decisions in a meaningful way.

To sum up, information is not in short supply on Capitol Hill, but *information is not knowledge.* Credible sources are needed to provide timely analysis and synthesis of scientific and technical information as a foundation for Congressional decisions.

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[2] Arnold, R. Douglas, "The Local Roots of Domestic Policy," in Thomas E. Mann and Norman J. Ornstein (eds.), *The New Congress* (Washington: American Enterprise Institute, 1981), pp. 250–287.

[3] Davidson, Roger H. and Walter J. Oleszek, *Congress and Its Members, 3rd ed. (Washington, DC: CQ Press, 1990).*

[4] Kelly, Henry et al., *Flying Blind: The Rise, Fall and Possible Resurrection of Science Policy Advice in the United States,* Federation of American Scientists, 2004.

These concerns are not new. A 1970 report found that Congress lacked sufficient "independent sources of scientific and technical advice."[5] This realization led to a number of important organizational innovations. The even greater role of science and technology in today's society demands that we seek innovative methods suited to 21st Century needs to provide Congress with objective, timely, policy-relevant analyses—that is, knowledge that Members can use.

About the American Association for the Advancement of Science (AAAS)

The American Association for the Advancement of Science (AAAS) is the world's largest multi-disciplinary scientific society and publisher of the journal *Science (www.sciencemag.org).* The non-profit AAAS *(www.aaas.org)* is open to all, and our members come from the entire range of science and technology disciplines. *Science* has the largest paid circulation of any peer-reviewed general science journal in the world, with an estimated total readership of over one million. AAAS fulfills its mission to "advance science and serve society" through initiatives in science education; science policy; international programs; and an array of activities designed both to increase public understanding and engage the public more with science. Programs designed to provide Congress with scientific resources include:

AAAS Science & Engineering Policy Fellowships. The Science & Technology Policy Fellowships *(http://fellowships.aaas.org/)* began in 1973 with seven Fellows serving in congressional offices, providing their scientific expertise to policy-makers facing increasingly technical legislative issues. The ensuing decades have led to the establishment of AAAS Science & Technology Policy Fellowships in nearly a dozen executive branch agencies.

The fellowships provide the opportunity for scientists and engineers, from recent Ph.D. recipients to senior-level professionals, to learn about policy-making while contributing their knowledge and analytical skills to the Federal Government. About 30 other scientific and engineering societies participate, selecting and funding their own Fellows.

The Fellows, representing a broad array of science and engineering fields, bring a common interest in learning about the intersection of science and policy, and a willingness to apply their technical training in a new arena. The host offices value the Fellows for their external perspectives and critical thinking skills, as well as for their technical expertise.

Center for Science and Technology in Congress. The Center for Science, Technology, and Congress *(http://www.aaas.org/spp/cstc/)* is one of the principal channels for AAAS communication between the scientific community and the legislative branch of the U.S. Government. It was established in 1994, under an initial grant from the Carnegie Corporation of New York. The Center's primary function is to facilitate communication between the science and engineering community on the one hand and the legislative community and the public it represents on the other.

AAAS's inclusiveness and breadth of coverage among fields of science and engineering enable it to both draw upon and reflect the views of virtually the entire science and technology enterprise. The Center's multi-faceted strategy is a strong example of how AAAS approaches its mission and long-term goals. It reports on S&T-policy relevant news through the monthly newsletter *Science & Technology in Congress;* the Center organizes congressional briefings; it provides Policy Briefs on critical scientific issues facing policy-makers; and it assists in the preparation of AAAS formal statements and resolutions, congressional testimony, and letters to the executive and legislative branches of governments. Its activities reach out to Members of Congress and staff, AAAS affiliates, academic institutions, science attaches, and the media.

Center for Science, Technology, and Security Policy. The Center for Science, Technology and Security Policy *(http://cstsp.aaas.org/)* was established by the AAAS through support from the Science, Technology & Security Initiative at the MacArthur Foundation. The goal of the Center is to encourage the integration of science and public policy for enhanced national and international security. The Center acts as a portal that facilitates communication between academic centers, policy institutes, and policy-makers.

The Center speeds the delivery of balanced technical analysis to Congress, Executive Branch agencies and the public at large through monthly briefings, special reports from panels of technical experts, and partnerships with the broad inter-

[5] von Hippel, Frank and Joel Primack, *The Politics of Technology: Activities and Responsibilities of Scientists in the Direction of Technology* (Stanford, 1970)

national network of leading universities, think-tanks, professional societies and non-governmental organizations.

R&D Budget and Policy Program. Every year since 1976, AAAS has published a report analyzing research and development (R&D) in the proposed federal budget in order to make available timely and objective information about the Administration's plans for the coming fiscal year to the scientific and engineering communities and policy-makers. At the end of each congressional session, AAAS publishes a report reviewing the impact of appropriations decisions on research and development, entitled *Congressional Action on Research and Development in the Budget.* AAAS has also established a website *(www.aaas.org/spp/R&D)* for R&D data with regular updates on budget proposals, agency appropriations, R&D trends in past years, and outyear projections for R&D, as well as numerous tables and charts.

BIOGRAPHY FOR ALBERT H. TEICH

Albert Teich is Director of Science & Policy Programs at AAAS, a position he has held since 1990. He is responsible for the Association's activities in science and technology policy and serves as a key spokesperson on science policy issues. Science and Policy Programs, which includes activities in ethics, law, science and religion, and human rights, as well as science policy, has a staff of 40 and a annual budget of about $9 million. He also serves as Director of the AAAS Archives.

He received a Bachelor's degree in physics and a Ph.D. in political science, both from M.I.T. Prior to joining the AAAS staff in 1980, he held positions at George Washington University, the State University of New York, and Syracuse University. Al is the author of numerous articles and editor of several books, including *Technology and the Future,* the most widely used college textbook on technology and society, the tenth edition of which was published by Thompson Wadsworth in 2005.

Al is a Fellow of AAAS and the recipient of the 2004 Award for Scientific Achievement in Science Policy from the Washington Academy of Sciences. He is a member of the editorial advisory boards to the journals *Science Communication; Science, Technology, and Human Values; Prometheus;* and *Renewable Resources* and a consultant to government agencies, national laboratories, industrial firms, and international organizations. He is a Past Chair of the Board of Governors of the U.S.–Israel Binational Science Foundation, where he remains a member of the executive committee; a member of the External Research Advisory Board of the University of California at Davis, the Norwegian Research and Technology Forum in the United States, and the National Research Council's Research and Technology Transfer Committee.

Al is married to Jill H. Pace, Executive Director of the American College of Real Estate Lawyers. He has three children and three grandchildren. He is an accomplished amateur photographer, has published several photographs, and had a one-man show of his photographs at the Black & White Gallery in Arlington, Virginia, in 2005, and another in the AAAS Science and Art Exhibition Gallery in 2006.

July 20, 2006

The Honorable Sherwood Boehlert
Chairman, Science Committee
2320 Rayburn Office Building
Washington, DC 20515

Dear Congressman Boehlert:

Thank you for the invitation to testify before the Committee on Science of the U.S. House of Representatives on July 25th for the hearing entitled "***Scientific and Technical Assessment and Advice for the U.S. Congress.***" In accordance with the Rules Governing Testimony, this letter serves as formal notice of the federal funding I currently receive related to the hearing topic.

Although AAAS receives federal funding for a variety of projects, we received no federal funding directly supporting the subject matter on which I will be testifying, in the current fiscal year or either of the two preceding fiscal years.

Sincerely,

Albert H. Teich
Director

Science and Policy Programs

American Association for the Advancement of Science
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www.aaas.org/spp

Chairman BOEHLERT. Thank you very much, Doctor, and just let me point out, and I think on behalf of the entire Committee, both sides of the aisle, the AAAS Fellows program is a wonderful program that is warmly embraced by all.

But it is a two way street, and I would suggest that some of the Fellows who come up, as you say, get Potomac Fever and they stay, and that is good, because that helps us be better informed. There are some in our committee and in our respective individual offices, but most of the AAAS Fellows go back from whence they came, into the community. And that is good for science, because I find, in most instances, science, scientists are not particularly effective at lobbying for their interests. They need guys like me to be lobbyists, because well—and Mr. Gordon.

So, it works well. So, you have a better appreciation for how the political process works, and—because of the Fellows coming back, and the Fellows who we retain guide us, and we have a better appreciation for the science of the subject matter we are dealing with. So, keep it up please.

Dr. TEICH. Thank you.

Chairman BOEHLERT. Expand it, if anything.

Dr. Blair.

STATEMENT OF DR. PETER D. BLAIR, EXECUTIVE DIRECTOR, DIVISION ON ENGINEERING AND PHYSICAL SCIENCES, NATIONAL ACADEMY OF SCIENCES

Dr. BLAIR. Thank you for the invitation to testify today about science and technology assessment advice to the Congress. The subject is certainly a longstanding one with me, that I have seen from different perspectives in my professional life. So I appreciate the opportunity to share those experiences and perspectives with you and the Committee.

The breathtaking pace of science and technology over the past half-century has delivered both staggering benefits to society as well as sobering challenges associated with the role of technology in virtually every aspect of our lives. Society, in reaping the benefits, must also be able to cope with the challenges.

Indeed, among the Founding Fathers' deepest concerns about the fledgling American democracy was that it could function well only when the electorate, and in particular, its institutions of government, are well informed about the issues upon which it must decide. On the slide are Mr. Madison's sentiments on the matter.

Because science and technology issues, perhaps in particular, are so complex, or often so complex, and have such impact on society, a government poorly informed on such issues is destined to make bad policy choices. Yet today, it is becoming increasingly difficult for anyone, or even any institution, to keep pace with the frontier of scientific knowledge. So how, then, can the Congress acquire useful, relevant, informed, independent, objective, authoritative, and timely advice on science and technology dimensions of the issues it faces?

The information revolution has dramatically expanded the quantity of information available to the Congress, but more has not proved necessarily to be better. Indeed, a fundamental problem today is not the quantity of information at all, but rather, how to

gauge validity and usefulness within the flood of available information, advice, and advocacy.

Another way to put this is Will Rogers' old observation that "What gets us into trouble isn't so much what we don't know, it is what we know for sure that just ain't so." The former chairman had a similar perspective called a defense against the dumb.

Congress certainly has many possible resources at its disposal, such as universities, think tanks, the professional societies, trusted constituents, existing Congressional agencies, and of course, the National Academies. My colleagues on the panel will explore some of these options, so I will focus on three points.

First, the current and evolving role of the Academy in providing advice to the Congress through its—principally, through its operating arm, the National Research Council. Second, what I consider to be an especially important gap in the sources of advice available to the Congress, and third, some concluding thoughts on the options.

As an additional and more detailed discussion, I refer to a report, "Scientific Advice for Policy in the United States: Lessons from the National Academies and the Former Congressional Office of Technology Assessment," which I would like to include for the hearing record. In that document, and also, in my written statement, I recap for you the charter of the Academies, and how today, our studies continue to be among those most familiar and respected sources of independent scientific advice to the Congress.

Indeed, Academy committees produce over two hundred reports annually, of which between 15 and 25 a year are mandated by Congress, which means that while the Academy is a substantial enterprise in the science and technology advice world overall, its role specifically for the Congress is actually a relatively small part of the portfolio. We could do more, and indeed, as my colleagues on the panel will attest, the entire science community could do much more.

The key strengths of the NRC in providing advice to the Congress are principally threefold. First, the long established reputation for credibility, enhanced by its association with the prestigious memberships of the Academies. Second, a historical ability to convene leading experts, and third, a well established and respected study process, designed to maintain balance and objectivity throughout a study committee's work, that produces reports considered to be both unbiased and authoritative.

The resulting NRC study reports often serve an important need of Congress, that is, an authoritative set of consensus findings and recommendations from a widely recognized group of experts, often leading to a specific recommended course of action. Some of the sample reports shown on this slide should be very familiar to this committee, you have talked about just in recent weeks, and one the chairman mentioned a while ago.

Nonetheless, like any process designed to serve many needs, the NRC study process is not perfectly tuned to serve all government needs. For example, our process is less well equipped, currently, to go beyond technical analysis, to gauge the broader policy implications of alternative actions, especially those implications that may involve fundamental value judgments or tradeoffs for which it may

be difficult to impossible to achieve consensus. In short, and at some risk of being simplistic, what seems to be missing is a mechanism to inform the Congressional debate, including perspectives that may go beyond science and technology to include the broader implications of alternative actions related to science and technology issues being considered, and especially, a comprehensive evaluation of such perspectives. In the question period, I would be happy to offer some examples.

In my view, both of these kinds of analysis, that is, both the traditional NRC study and this new type of study I am talking about, are important to Congressional deliberations. Since the closure of OTA now a decade ago, this latter type of analysis, as performed by a disinterested, analytical organization tuned specifically to the needs of Congress, is not readily accessible to the Congress.

Such a function may need to be reconstructed in some way, through adapting an existing organization, or through creation of a new organization answerable directly to the Congress, or perhaps by creating a new process within an existing Congressional agency. There are some experiments underway at GAO, for example.

Let me conclude by reiterating that the need for useful, relevant, informed, independent, objective, authoritative, and timely advice on the science and technology issues to the Congress is becoming more and more noticeable out here. There are certainly a variety of options for filling the various gaps, including the specific gap I mentioned today. We at the Academy look forward to playing a role in building those various options. I mentioned Will Rogers' advice earlier, but perhaps Yogi Berra's advice seems appropriate here concerning which path to take on improving and expanding the mechanisms for science and technology assessment and advice to the Congress: "When you get to the road, and you have to—when you get to that fork in the road, and you have to choose, take it." Since there are multiple paths that you can follow.

Mr. Chairman, thank you again for the opportunity to share my thoughts, and I look forward to answer any questions you may have.

[The prepared statement of Dr. Blair follows:]

PREPARED STATEMENT OF PETER D. BLAIR

Mr. Chairman,

Thank you for the invitation to testify today about the science and technology advice to the Congress. The subject is certainly a longstanding one with me that I have seen from many perspectives—from academia, to private science and engineering consulting, to a senior management role in the former Office of Technology Assessment (OTA), to managing a professional scientific society, to my current post at the National Academies. I appreciate the opportunity to share those experiences and perspectives with you and the Committee.

The breathtaking pace of science and technology over the past half-century—from the remarkable advances in medicine, to cell phones, to the Internet, to countless others—has delivered both staggering benefits to society as well as sobering challenges associated with the role of technology in virtually every aspect of our lives. Society, in reaping the benefits, must also be able to cope with the challenges.

Among the founding fathers' deepest concerns about the fledgling American democracy was that it could function well only when the electorate and, in particular, its institutions of government are well informed about the issues upon which it must decide.

James Madison or Thomas Jefferson might well have argued that a government poorly informed about science and technology issues, because such issues are often so complex and have such impact on society, is destined to make bad policy choices.

Yet, today, it is becoming increasingly more difficult for anyone, or even any institution, to keep pace with the frontier of knowledge. How, then, can the Congress receive useful, relevant, informed, independent, authoritative and timely advice on the science and technology dimensions of the issues it faces? So your hearing today is important and timely.

Introduction

In the last decade the information revolution has dramatically expanded the quantity of information available to the Congress, but more information is certainly not necessarily better information. Indeed, a fundamental problem now is not really the lack of information; rather, it is how to gauge validity and usefulness within the flood of available information and advice.

Congress certainly has many possible resources at its disposal, ranging from universities, to independent think tanks, to existing Congressional agencies such as GAO, CBO, and CRS, and, of course, the National Academies. Other witnesses at this hearing will explore many of these options, so in my testimony I will focus on (1) the current and evolving role of the National Academies in providing advice to Congress, (2) what I consider to be an especially important gap in the current sources of advice for Congress, and (3) some thoughts related to a number of the options under consideration for filling this gap.

As an additional and more detailed discussion of some of these issues I would like to include for the record a report I prepared for a conference in Berlin earlier this year on precisely this topic: *Scientific Advice for Policy in the United States: Lessons from the National Academies and the former Congressional Office of Technology Assessment.*[1]

The Traditional Role of the National Academies

Today, among the most familiar sources of independent scientific and technical advice to Congress is the collection of organizations we now refer to as the National Academies, which include the National Academy of Sciences (NAS), the National Academy of Engineering (NAE), the Institute of Medicine (IOM), and their "operating arm," the National Research Council (NRC). In 1863 Congress chartered the NAS as an independent non-profit corporation to "whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject of science or art." This charter was signed by President Lincoln during the height of the U.S. Civil War, and the President was among the first to call upon the Academy for advice.

Today, the NAS, NAE, and IOM are each honorary societies that elect new members to their ranks annually and all operate under the original NAS charter. The NRC assembles committees of academy members and other experts to carry out studies for executive branch agencies, but Congress also frequently mandates studies by the NRC spanning the entire spectrum of science and technology related issues. The NRC produces around 200 reports annually, of which approximately 25 are mandated by Congress.

The studies at the National Academies involve nearly 10,000 volunteers annually serving on expert committees and in the review process as well as over a 1,000 professional staff. In the science and technology advice world, the Academy is a substantial enterprise for providing advice to the Federal Government in a broad range of areas, although the role specifically for Congress has traditionally been a relatively small part of the overall Academy portfolio.

The key strengths of the NRC in providing advice to the Administration and to Congress are its long-established reputation for credibility, its convening power, and the integrity of its study process resulting in reports widely accepted as unbiased. Some features of these key strengths include the following:

- **Credibility.** Perhaps the principal strength of the NRC is its institutional credibility, enabled significantly by its association with the prestigious memberships of the NAS, NAE, and IOM. The process by which this nongovernmental institution conducts its work is designed to ensure the results are evidence-based and tightly reasoned, and its independence from outside influences and pressures from various interest groups including government agencies. It should also be noted that the Academies conduct several studies each year using our own endowment or foundation sources, often focusing on topics that the Academies believe to be important but that the government may not be willing or able to fund. Examples include the recent effort, *Rising Above*

[1] Forthcoming in *Proceedings of the Symposium on Quality Control and Assurance in Scientific Advice to Policy,* Working Group on "Scientific Advice to Policy in Democracy," Berlin-Brandenburg Academy of Science & Humanities, Berlin, Germany, January 12, 2006.

the Gathering Storm: Energizing and Employing America for a Brighter Economic Future, and the 2002 study *Making the Nation Safer: The Role of Science and Technology in Countering Terrorism* as well as many others very well known to this committee.

- **Convening Power.** A second major strength is the convening power of the NRC. That is, the experts invited by the NRC to participate in its studies generally accept the invitation and are willing to invest considerable time and energy on a *pro bono* basis. Studies are carried out by groups of volunteers who are broadly considered among the best experts on the issues to be studied, are free of conflicts of interest, and have very carefully balanced biases. Because of the breadth of membership in the academies and the links of the organization to the scientific and technical communities worldwide, the NRC is well equipped to identify and recruit leading experts to serve on study committees.
- **Study Process and Products.** Finally, another key strength that has continued to evolve over the years is the NRC study process itself that is designed to maintain balance and objectivity throughout a committee's work and that produces reports considered to be both unbiased and authoritative. A key quality control feature in the process is independent peer review. After consensus is achieved by a study committee and a draft report is prepared, the NRC process requires the committee to address all of the comments from a carefully selected collection of peer reviewers, whose identity is not revealed to the committee until the study is publicly released.

Challenges for Serving Congressional Needs

Over the years the NRC process has proved consistently to be a strong model for providing independent authoritative advice to government. Like any process designed to serve many needs, however, it is not perfectly tuned to serve all the needs of all parts of government that need science and technology advice. The most commonly cited issues associated with the NRC study process, especially perhaps as they relate to Congressional needs, are the following:

- **Cost.** It is often perceived to be expensive to commission an NRC study; even though committee members are volunteers whose time is contributed *pro bono* (except for travel expenses). At least in part this perception is due to the fact that a separate contract is negotiated for each individual study—unlike the central funding for agency advisory committees.
- **Timeliness.** The NRC process, which includes commissioning and contracting for the study, selecting and convening a study committee, arranging subsequent meetings among busy people who are serving on a volunteer basis, and navigating a report through peer review, editing, production, and release takes time. The average time for an NRC study is 18 months, but can be longer. It should also be noted, however, that studies can be carried out quite rapidly given an important national need or specific agency or Congressional requirements. As examples, both *Rising Above the Gathering Storm* and *Making the Nation Safer,* noted earlier, were completed in about six months and a widely cited study, *Climate Change Science,* was completed in one month.
- **Sources of Sponsorship.** Most NRC studies are commissioned and paid for by federal agencies through contracts, even those mandated by Congress which adds the additional hurdle of enacting a law. On the one hand, this is beneficial in that it helps ensure that what the NRC does is relevant and important, and the diversity of support helps assure independence. On the other hand, it often takes six to nine months through a government procurement process to initiate an NRC study even after a mandated study has been enacted in law (or included in report language). For those studies mandated by Congress, an additional delay often results from the time needed to enact the relevant legislation.

A Gap in Types of Advice Currently Available to Congress

The NRC study process is well developed and serves an important need of Congress—**an authoritative set of findings and recommendations from widely recognized experts, often leading to a specific recommended course of action.** In particular, NRC committees are usually assembled with the intention of achieving consensus recommendations supported by evidence. In a very controversial subject area with scientific and other uncertainties, if a broad set of perspectives are included in the study committee, as one might expect if the purpose is to

include all possible scientific and other perspectives on a problem, a consensus might be difficult to achieve. This is why the NRC places a high priority on an appropriately balanced committee and a rigorous information-gathering phase of a committee's work, where such perspectives are heard.

Since the historical focus of the NRC process has been on delivering consensus-based advice on science and technology topics, the process is less well equipped to elaborate on the broader context of an issue and inform the policy debate with careful and objective analysis of the policy consequences of alternative courses of action, especially those that may involve value judgments and trade-offs beyond the scope of technical analysis. Consequently, it has been far less common for the NRC to assemble committees charged with identifying and evaluating the pros and cons of a range of alternative policy options, although it would certainly be possible to develop such a study process in the National Academies.

Both types of analysis just described are important to congressional deliberation depending upon the circumstances. With the closure of the former Office of Technology Assessment (OTA), the latter type of analysis as performed by a disinterested analytical organization is no longer readily accessible to the Congress and may need to be reconstructed in some way, either through adapting an existing organization or through creation of an organization that is answerable directly to the Congress or perhaps creating a new process within an existing Congressional agency.

As an example illustrating the analysis gap just noted, consider the case where Congress may be interested in the future of the Nation's electric power system, following a major blackout. The salient issues could be posed in two alternative ways:

- One type of study would be to seek an authoritative set of recommendations for making the system more secure and reliable in the wake of blackouts or threats of terrorist attacks on the Nation's infrastructure. In such a study, the well established NRC approach would be to assemble a committee of experts, review what is known about the power system and where it is headed, and deliver specific engineering and operational recommendations about how to improve system reliability and performance. Indeed, we currently have such a study underway to assist the Department of Homeland Security.
- In another type of study, Congress might be interested in exploring the technical as well as societal, environmental, economic, regulatory, or other broad implications of alternative scenarios for the future of the Nation's electric utility industry, perhaps once again precipitated by a blackout. Not only technical, but also political, economic, social, environmental, and probably many other kinds of tradeoffs and value judgments are involved in characterizing a series of scenarios for the future structure of the industry, ranging from moving toward a national centrally controlled grid to fully deregulating wholesale and retail electricity segments of the industry.

These two types of studies are not necessarily mutually exclusive, but unlike the first case, in the second case a set of consensus recommendations is not the principal objective, and the collection of stakeholders and experts necessary to carefully identify and explore these alternatives would be considerably different than for the study committee structured to reach an evidence-based, tightly reasoned consensus recommendations based on scientific evidence and on specific technical issues.

In short, and perhaps at the risk of being simplistic, the first type of analysis is designed **to illuminate the scientific and technical aspects of a problem to help in directing a specific course of action** while, in the second case, the analysis is designed principally **to inform the Congressional debate, including perspectives that may go beyond science and technology about the broader implications of alternative actions related to the science and technology issues being considered,** but both types of analysis are very important to Congressional deliberations.

Evolving Study Processes at the NRC

The fact that the NRC process does not now accommodate the second form of advice noted above does not mean that it could not; indeed, NRC processes to do change from time to time in response to government needs. As a case in point—the horrific terrorist events of September 11, 2001 spurred widespread interest in findings ways to contribute to the understanding of the science and technology dimensions of homeland security and countering terrorism. Specifically, many government agencies expressed urgent needs for immediate advice in these areas. In response, the NRC used its convening power to assemble small groups of experts who then provide advice as individuals, rather than as a group constituting an NRC committee. Such "real-time" advice, which is done orally and not by a written report, does not carry the imprimatur of the NRC study process, especially the quality

control aspects of committee deliberation and peer review of a written report. It does, however, provide a new means of satisfying a real need of the government, i.e., providing timely input to policy makers and other organizations, including the Government Accountability Office (GAO) with whom we now have a longstanding relationship along these lines.

Additional Congressional needs vary widely, including such deliverables as (1) "instant education" on a complex science and technology issue, (2) "translations" of authoritative reports to more readable and understandable language tuned to the needs of broad policy-makers, (3) summaries of landmark authoritative reports, and (4) updates or adaptations of existing reports and information to current needs, and (5) readily available and trusted expert consultants on call to help with quick turnaround questions and interpretations of complex technical information. Some of these capabilities are accessible to varying degrees through the Congressional Research Service and through various other means. Missing, however, especially since the closure of OTA, is an ability to provide comprehensive analysis in any organized or readily accessible way by an organization directly accountable to Congress.

Collaboration and a GAO Experiment

In an experiment to test the feasibility of developing a "technology assessment" capability in the Government Accountability Office (GAO), a first-of-a-kind GAO technology assessment report on biometric technologies was released in 2002. The NRC did not participate in developing this assessment, but it did use its contacts to assist the GAO in identifying individuals with the proper expertise. There are some shortcomings in the approach adopted by the GAO in carrying out its first attempt at a technology assessment, most notably the lack of a substantive and accountable peer review process. Nevertheless, the experiment has been more successful than many anticipated and the GAO seems receptive to incorporating improvements suggested by a review group commissioned to review the GAO approach. In particular, the group identified a number of significant organizational challenges that it felt were necessary to refine the GAO approach, such as the incorporation of a mechanism for peer review, which could then possibly evolve into a more mature technology assessment capability within the legislative branch.

Whether the GAO is capable of such reforms on a larger scale remains to be seen, but it seems fair to conclude that the initial GAO experiment has yielded evidence sufficient to continue the experiment. We are pleased that the NRC's modest role in this experiment, by providing experts to talk with GAO, appears to have been one of the successful features of this approach and may constitute a way in which the National Academies can contribute to a renewed technology assessment capability within the legislative branch, in addition to its more traditional response to congressionally mandated requests for assistance. Such a mechanism provides the GAO a degree of access to the National Academies' considerable network of technical expertise. If needed, the Academies would also be willing to conduct similar studies commissioned by GAO to aid in responding to important Congressional requests.

The Former Office of Technology Assessment

By comparison with and in contrast to the NRC study process, the former Office of Technology Assessment (OTA) study process used an authoritative committee of volunteers as an advisory panel rather than assuming authorship of the study itself, which was produced by professional staff. As with NRC reports, OTA reports were also subject to a rigorous peer review. On the one hand, this approach permitted easier regulation of the role of the committee, particular if achieving a consensus in a broad controversial area was unlikely, but, on the other hand, such a practice also sacrificed the authoritativeness of the volunteer experts as authors of the report, an important feature of the NRC process.

Because the former OTA panels were advisory, and not the report's authors, the necessity of reaching a consensus was seldom an issue. Indeed, OTA was prohibited in its enabling legislation from making recommendations, so the panel was created to try to collect the views of all important stakeholders rather than to try to produce consensus recommendations (although consensus findings and conclusions were provided and viewed as important by requesting Congressional committees). Instead, the OTA project teams sought to analyze and articulate the consequences of alternative courses of action and elaborate on the context of a problem without coming to consensus recommendations on a specific course of action, which would be difficult anyway with a diverse group with points of view that prevented consensus on many controversial issues.

If required to come to a consensus set of recommendations, even if it were permitted under the enabling legislation, the former OTA model would likely be un-

workable for controversial subjects with many opposing points of view. Nonetheless, the type of study undertaken by the former OTA was an important input to Congressional deliberation and it has not yet been reproduced in the Legislative Branch agencies or elsewhere, including the National Academies. The Academies could carry out such studies but that would require some changes in its study procedures for such studies as indicated above.

Conclusions

The National Academies have enjoyed a longstanding and effective working relationship with Congress on even the most contentious issues. There are, no doubt, many characteristics of that relationship that could be improved, both to perform the traditional NRC role more effectively and to provide some opportunities to expand that role.

The gaps I mentioned earlier in the mechanisms for providing useful, relevant, informed, independent, authoritative and timely advice on the science and technology issues to the Congress are becoming more and more noticeable. There are certainly a variety of options for filling these gaps, some of which might involve the Academy and some that would not. Many of them are worthy of serious consideration and we in the National Academies look forward to playing a role in this very important area in whatever mechanism develops. Thank you again for the opportunity to share my thoughts with you today and I look forward to addressing any questions the Committee might have.

Science and Technology Advice to Congress: Then, Now and Looking Forward

The Current and Potential Role of the National Academies

Peter D. Blair, Ph.D.
Executive Director
Division on Engineering and Physical Sciences
National Research Council

July 25, 2006

Context: increasing role of science and technology (S&T) in society & public affairs

- S&T impacts every aspect of modern life
  - as a fundamental contributor to improved quality of life
  - but new discoveries also often lead to social and ethical issues: nuclear weapons, genetically modified foods, stem cells, internet privacy, climate change, …
- Governments must deal with both benefits and challenges, but today's pace of discovery challenges society's ability to cope with implications
- Poor understanding creates problems at all levels of government and the public

A Premise of Democracy

"A popular government, without popular information, or the means of acquiring it, is but a prologue to a farce or a tragedy; or, perhaps both. Knowledge will forever govern ignorance. A people who mean to be their own governors, must arm themselves with the power with which knowledge gives."

James Madison, 1822

The Challenge of Providing Science and Technology Advice to Congress

- S&T issues are complex and can have enormous impact
- Congress is not well equipped to understand the *scale, scope, pace and implications* of S&T change
- Information revolution has expanded availability of information, but more isn't always better
- How to provide *useful, relevant, informed, independent, authoritative and timely* advice?

Founding the National Academy of Sciences

chartered by Congress in 1863 to:

"Whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject of science or art."

Traditionally Cited NRC Strengths

- Credibility
  - Association with NAS, NAE and IOM
  - Long history of authoritative advice
- Convening Power
  - Track record attracts authoritative experts willing to participate
  - *Pro Bono* participation by recognized experts
- Study Process
  - Well established process recognized as independent and objective
  - Strong quality assurance and control features

A Gap in S&T Advice to Congress

- NRC's principal objective is *to provide authoritative, consensus-based recommendations regarding specific courses of action*
- Missing, since the closure of OTA, is a mechanism to *to inform the debate,* in a comprehensive way, i.e., to acquire from a disinterested source a careful and objective analysis of the broad policy consequences of alternative courses of action related to S&T change, without recommending a specific course of action.

Some Options for Filling the Gap

- Adapt or add to an existing organization
- Create a new organization answerable directly to Congress
- Create a new process within an existing Congressional agency

"be within and/or responsible to the legislative branch of the Government … to provide early indications of the probable beneficial and adverse impacts of the applications of technology and to develop other coordinate information which may assist the Congress"

Some Conclusions

- The need for *useful, relevant, informed, independent, authoritative and timely* S&T advice is becoming more urgent
- There are many options to fill the gap, especially for providing broad comprehensive advice tuned to Congressional needs
- When you get to the fork in the road – take it!

BIOGRAPHY FOR PETER D. BLAIR

Peter Blair joined the National Research Council's (NRC) Division for Engineering and Physical Sciences as its first Executive Director in 2001, responsible for the NRC's portfolio in defense, energy and environmental systems, information and telecommunications, physics, astronomy, mathematics and operations research, aeronautics and space science and engineering, materials, manufacturing and engineering design, and civil engineering infrastructure.

Prior to his appointment at the NRC, from 1996–2001, Dr. Blair was Executive Director of Sigma Xi, the Scientific Research Society and publisher of *American Scientist* magazine, as well as an Adjunct Professor of Public Policy Analysis at the University of North Carolina at Chapel Hill.

From 1983–1996 Dr. Blair served in several capacities at the Congressional Office of Technology Assessment (OTA), concluding as Assistant Director of the agency and Director of the Industry, Commerce and International Security Division where he was responsible for the agency's research programs on energy, transportation, infrastructure, international security, space, industry, commerce, and telecommunications. He received the OTA's distinguished service award in 1991.

Prior to his government service, Dr. Blair served on the faculty of the University of Pennsylvania with appointments in the graduate groups of energy management, regional science, and public policy and was a co-founder of Technecon, Inc., a Philadelphia engineering-economic consulting firm specializing in investment decision analysis of energy projects and in developing, financing, and managing independent power generation projects.

Dr. Blair holds a B.S. in engineering from Swarthmore College, an M.S.E. in systems engineering and M.S. and Ph.D. degrees in energy management and policy from the University of Pennsylvania. He is the author or co-author of three books and over a hundred technical articles in areas of electric power systems engineering, energy and environmental policy, computer modeling of energy systems, regional science and input-output analysis, and commercialization of new technology.

THE NATIONAL ACADEMIES

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July 19, 2006

The Honorable Sherwood Boehlert
Chairman, Science Committee
2320 Rayburn Office Building
Washington, DC 20515

Dear Congressman Boehlert:

Thank you for the invitation to testify before the Committee on Science of the U.S. House of Representatives on July 25 for the hearing entitled "Scientific and Technical Assessment and Advice for the U.S. Congress." In accordance with the Rules Governing Testimony, this letter serves as formal notice that I received no federal funding directly supporting the subject matter on which I testified, in the current fiscal year or either of the two proceeding fiscal years, with the possible exception of a standing contractual arrangement between National Academies and the Government Accountability Office to support GAO analyses with meetings of technical experts. I refer to this arrangement in my testimony and expenditures against this contract by all National Academies units between 2002 and June 29, 2006 were $1,349,338.

Sincerely,

Peter D. Blair

NATIONAL ACADEMY OF SCIENCES • NATIONAL ACADEMY OF ENGINEERING • INSTITUTE OF MEDICINE • NATIONAL RESEARCH COUNCIL

Chairman BOEHLERT. And thank you for sharing the wisdom of one of the most beloved Yankees.

Dr. Hunt.

STATEMENT OF DR. CATHERINE T. HUNT, PRESIDENT–ELECT, AMERICAN CHEMICAL SOCIETY; LEADER FOR TECHNOLOGY PARTNERSHIPS, ROHM AND HAAS COMPANY

Dr. HUNT. Chairman Boehlert, Ranking Member Gordon, and distinguished Members of the Committee.

Good morning. My name is Dr. Catherine Hunt, and I am pleased to address you this morning on behalf of the more than 158,000 members of the American Chemical Society, the largest professional society in the world, or I should say, the largest scientific society in the world. I am the 2007 President of the Society, and I am also a technology manager at the Rohm and Haas Company, an $8 billion specialty materials company, where I build and champion technology partnerships across industry, academia, and national labs.

In this age of lightning fast technological advancement, and potentially massive information overload, it is increasingly important that Congress have a reliable, credible, and unbiased source of scientific and technical advice to help sort through complex and often conflicting data.

Take this glass of water, for example. It looks perfectly clean and pure, but as an analytical chemist, I can tell you that there are trace chemicals and minerals in this water that we couldn't detect even five years ago. Today's analytical technologies can take us down to the part per quadrillion level. That is part per quadrillion. That would be one inch in the distance it would take you to travel to Mars round trip 168 times. So, are these substances bad or good? Should they be banned or enhanced? Any such decision should be based on sound technical assessment.

In essence, the flow of scientific and technical information to Congress from any source should be subject to critical measures. In other words, I would like to hear everyone say: Is this accurate? Is it complete? Is it current? And most importantly, is it reliable? To be useful, it is critical, and you have heard this morning, that this information be available in a timely manner, and that it be easily used and understood by those with and also without extensive scientific and technological background.

Since ACS was founded in 1876, the effective dissemination of reliable information and advice has been one of the Society's central tenets. In fact, ACS was chartered by Congress in 1937 to share scientific knowledge with a broad constituency, including Congress and the executive branch.

Since the elimination of the Office of Technology Assessment in 1995, Members of Congress have had to rely more heavily on their personal staffs, and on the relatively small number of expert professional staff that populate committees like yours. Also since 1995, the ACS has hosted 109 *Science & the Congress* program briefings on Capitol Hill, seeking to present unbiased information on technical and public policy subjects. Congressional staff tell us that these briefings provide balance of views and information that is what I need to know and when I need to know it.

To meet its needs for S&T assessments, Congress clearly should continue to use outside experts, including the National Academies, to provide nonpartisan analysis of large scale, complex issues. However, these experts cannot meet all of Congress's frequent and extensive needs.

Congress does also tap into the expertise at the Congressional Research Services and the GAO, as you have already heard this morning. But again, these support agencies are not currently structured to perform all of the analysis required by legislators.

So, in summary, ACS, the American Chemical Society, believes that Congress should consider establishing an in-house science and technology unit, a properly structured unit, and what do I mean by properly? I think it should have several qualities. It should be bipartisan. It should be sufficiently staffed to furnish complete analyses. It should have strong links to outside experts, to facilitate collecting a broad selection of inputs, and it should be staffed with professionals who are especially skilled, and I can tell you these are skills I look for in my staff to do technology assessment at Rohm and Haas, that they can look at the pros and cons of an issue, that they can look at the strengths and weaknesses, that they can identify opportunities and threats. And refining this input that they collect broadly into potential policy options for Congressional use.

It should consider leveraging current science and technology fellowships that we have heard about this morning. These have been funded by outside groups. And sponsor new fellowships to supplement the standing capabilities. I think it should also consider using existing models. I like to learn from the past, and to learn from what works in other places, if it can work for you. Looking at openness and peer review, that is what allows the National Academies and think tanks and others to assemble world class science and technology reports.

So, in closing, a new science and technology unit should be equally effective in performing two sometimes contradictory functions. First, assembling world-class science and technology assessments, and second, providing information to Congress in a form and manner that facilitates your making sound policy decisions.

So, with that, I would like to thank you for allowing me to come and present our views on this important topic, and I would be happy to answer any questions that you may have.

[The prepared statement of Dr. Hunt follows:]

PREPARED STATEMENT OF CATHERINE T. HUNT

Chairman Boehlert, Ranking Member Gordon, and distinguished Members of the Committee:

Good Morning. My name is Dr. Catherine Hunt.

I am pleased to address you this morning on behalf of the more than 158,000 chemical professionals (chemists, engineers, educators and entrepreneurs) of the American Chemical Society (ACS), the largest scientific society in the world. I am the 2007 President of the Society and I'm also a technology manager with Rohm and Haas, an $8 billion specialty materials company, where I manage technology partnerships with the public and private sectors.

Today's hearing explores how Congress receives and analyzes the scientific and technological information that it requires to evaluate legislation, and how those information-gathering processes might be improved. As technology increasingly drives our nation's economy, security, and quality of life, the list of policy issues that de-

mand sound science and engineering understanding is rapidly expanding in size and complexity. Over the past month, the House has held hearings on topics ranging from energy to climate change, from cyber security to voting standards—all of which contain a strong element of science and that might have benefited from additional technological assessment. In fact, I don't believe that there is a Congressional Committee that does not in some manner deal with science and technology issues—even though it may not be obvious at first blush. For instance, if we consider water quality and supply, the Agriculture Committee is concerned about water conservation, the Energy and Commerce Committee has jurisdiction over drinking water, the Transportation Committee handles clean water, this committee has oversight of water-related research and the International Relations Committee needs to understand technologies that impact potable water resources in the Middle East.

Sometimes information received by these committees, though popularly accepted and reported as fact, ultimately turns out to be unreliable, or worse yet—false. I think we would all agree that legislative action taken on the basis of this type of information would be regrettable and potentially damaging. Sometimes public opinion can drive policy, but as important as public opinion and media reports are, we mustn't allow these to push a rush to judgment without a careful evaluation of the facts. This is where I think it becomes increasingly important that Congress have a reliable, credible and unbiased source for scientific and technical assessment to help it sort through complex and often conflicting data.

Take this glass of water as an example. It looks perfectly clean and pure—and it probably is. But given the new advances in chemical detection technology, I'd venture to say that we could find numerous trace chemicals and minerals in this glass that five years ago would have been impossible to detect. Today's analytical technology takes us down to the part per quadrillion level—a part per quadrillion is equal to one inch in the distance you must travel to make 168 roundtrips to Mars. But would we, or should we, legislate an immediate ban on the materials found in this glass of water just because we could detect them? In this example, I would suggest that information about the presence of these substances in and of itself should not be the basis for legislating a ban on the material, but rather such a decision should be based on an assessment of what impact, or potential impact, might these materials have on the health of the drinker—if any.

It is well known that the demands and expectations on Congress continue to increase. Ease and reliability of electronic communications has resulted in Congress being bombarded on a daily basis with hundreds of thousands of e-mails, faxes, and phone calls from interest groups, trade associations, scientific societies, and interested citizens and constituents. This constant river of communication is sorted, categorized, and assimilated by Members of Congress and their staffs to identify that most valuable of treasures in Washington—reliable information.

Since its founding in 1876, ACS has viewed the effective dissemination of reliable information and advice as one of its central functions. In fact, ACS was chartered by Congress in 1937 to share scientific knowledge with a broad constituency, including the Congress and the Executive branch. In truth, sharing scientific information is fundamental to scientific and technical societies and associations. Collectively, they provide a direct source of information and analysis via testimony and letters, face-to-face meetings and consultations, formal and informal communications, and other types of interactions.

These organizations also organize educational and informational briefings for members and staff on a wide variety of science and technology issues. Since 1995, the ACS Science & the Congress program has hosted 109 briefings on Capitol Hill that seek to provide balanced and unbiased first-hand information from subject-matter experts on a wide range of technical and public policy subjects. The feedback we have received from these briefings, which are well attended, is that they provide a balance of views and an educational overview for congressional staff who are generally seeking such information on a just-in-time, tell-me-what-I-need-to-know basis.

Many other stakeholders in the legislative process utilize the same tools and seek to provide similar services, including think tanks, universities, federal agencies, trade associations, and companies. Most of these groups place great emphasis on their own credibility before Congress and thus strive to be regarded as honest brokers of reliable information. However, to some extent, most of these outside sources of information have a vested interest in the outcome of your deliberations.

The flow of scientific and technical information to Congress from any source should be subjected to critical measures: Is it accurate? Is it complete? It is current? And, most importantly, is it reliable? To be able to use this information, it is also important that it be available in a timely manner and in a way that it is easily used by those without backgrounds in science and technology.

To meet its need for science and technology assessments, Congress clearly should continue to use outside experts, including the National Academies, to scope, integrate, and provide non-partisan analysis of large-scale complex issues involving science and technology. However, these experts cannot meet all of Congress' frequent and extensive needs, and ACS believes that Congress should have greater access to assessments on a wider range of subjects than outside organizations are capable of providing.

Since the elimination of the Office of Technology Assessment in 1995, Congress has functioned without an impartial internal unit that can frame complex issues, provide comprehensive and balanced insights and analysis, and set out policy options on science and engineering issues. Members of Congress have had to rely more heavily on their personal staffs and on the relatively small number of expert professional staff that populate committees like yours to perform this critical function. Congress also taps the professional expertise at the Library of Congress Congressional Research Services (CRS) and the Government Accountability Office (GAO).

Many experts believe that these congressional support agencies are not currently structured and staffed to perform all of the in-depth, unbiased scientific and technical analyses required by legislators. Congress should consider establishing an in-house science and technology unit that supplements their capabilities and provides timely, thorough assessments for decisions on issues involving a wide range of science, engineering, and technology. This unit could be housed in CRS, GAO, or stand alone as a congressional support agency.

What would such a unit look like? A properly structured, in-house unit should have sufficient staff to furnish complete analyses. It also should rely significantly on outside experts to refine their input for congressional use. Its operations should be economical and efficient in order to provide a regular stream of timely advice to Congress. The new science and technology assessment unit might also consider leveraging current science and technology fellowships funded by outside groups, and sponsor new fellowships to supplement its standing capabilities. By placing scientists and engineers in various legislative offices and committees, the new unit would be more relevant and approachable to all congressional members and staff.

To be effective, a new science and technology assessment unit must be equally effective in two sometimes contradictory functions—(1) assembling world-class scientific and technology assessments and (2) providing information to Congress in a form and manner that facilitates your making policy decisions. In the former area, the unit should use the existing models, including openness and peer review, that allow the National Academies, academics, and think tanks to assemble world-class science and technology reports. While I am not an expert on the latter challenge, I would observe that you are in the best position to determine how the unit should be organized to most effectively operate in your unique environment and meet your needs.

Thank you for this opportunity to present our views on this important topic. I will be happy to answer any questions you may have.

BIOGRAPHY FOR CATHERINE T. HUNT

Education and Employment

Dr. Catherine "Katie" T. Hunt is Leader, Technology Partnerships for Rohm and Haas Company, where she builds collaborations between the company, academia, government agencies, and private foundations. Since creating the unit in 2002, she has helped secure multi-million dollar grants from federal agencies to improve collaboration across all sectors of the chemical enterprise. In 2002, Dr. Hunt acted as a member of the steering committee for the "Nanomaterials and the Chemical Industry Roadmap Workshop," a collaborative effort between the Department of Energy Efficiency and Renewable Energy (DOE/EERE), the National Nanotechnology Initiative (NNI), and the Chemical Industry Vision 2020 Technology Partnership. As a result of this workshop, Dr. Hunt co-authored the *Chemical Industry R&D Roadmap for Nanomaterials by Design: From Fundamentals to Function.*

Dr. Hunt began her career in industry with Rohm and Haas Company in 1984 after completing an NIH Postdoctoral Fellowship at Yale University. Since then, Dr. Hunt has held a variety of positions at every level of the company from Senior Scientist in Analytical Research (1984) to Philadelphia Plant Laboratory Manager (1991) to Director of Worldwide Analytical and Computational Competency Network and Technology Development (1998). She was named to her current position in 2002.

Dr. Hunt holds an A.B. in Chemistry *(Cum Laude)* from Smith College, Northampton, MA, and a Ph.D. in Chemistry from the University of California, Davis. She has authored 13 papers, one book chapter on Metallothionein.

Professional Organization Leadership

Dr. Hunt is the 2006 President-Elect for the American Chemical Society. She will serve as President in 2007 and as a member of the Board of Directors from 2006–2008. She has been a member of the society since 1977. She is also an active member of the American Association for the Advancement of Science, the International Union on Pure and Applied Chemistry, and Sigma Xi. Dr. Hunt serves on the Board of Directors of the Council for Chemistry Research and was a participant in the Vision 2020 Industry Group.

Over her professional career Dr. Hunt has received many awards including being a member of the Women in Science Delegation to Cuba (2001); Best Paper Award from INDA, Association of Nonwoven Fabrics Industry (1997); Rohm and Haas Company, S.J. Talucci Quality Award (1996); and NIH Postdoctoral Fellowship (1982–1984).

American Chemical Society

The American Chemical Society is a nonprofit, member-governed organization that consists of more than 159,000 individual members at all degree levels and in all fields of chemistry and chemical engineering. The organization provides a broad range of opportunities for peer interaction and career development, for a wide range of professional and scientific interests. As the world's largest scientific society and in keeping with its congressional charter, ACS advances the chemical enterprise, increases public understanding of chemistry, and brings its expertise to bear on state and national matters.

American Chemical Society

OFFICE OF THE PRESIDENT

Catherine T. Hunt
President-Elect, 2006
President, 2007
Immediate Past President, 2008

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July 21, 2006

The Honorable Sherwood Boehlert
Chairman, Science Committee
2320 Rayburn Office Building
Washington, DC 20515

Dear Congressman Boehlert:

Thank you for the invitation to testify before the Committee on Science of the U.S. House of Representatives on July 25 for the hearing entitled "**Scientific and Technical Assessment and Advice for the U.S. Congress**."

In accordance with the Rules Governing Testimony, this letter serves as formal notice that neither the American Chemical Society nor I have received any federal funding directly supporting the subject matter on which I testified, in the current fiscal year or either of the two proceeding fiscal years.

Sincerely,

Catherine T. Hunt

Catherine T. Hunt

DISCUSSION

Chairman BOEHLERT. Thank you very much, Dr. Hunt. And let the Chair note for the record that the glass Dr. Hunt used in her illustration is half full.

You know, Dr. Blair gave an example of the kind of study that he thinks Congress is not getting, and although he noted that the Academy might be able to fill the gap. Could the rest of you on the panel describe a kind of study, a specific example, that Congress doesn't receive now, because we lack a mechanism to do so, and then, could you tell me what you think would be the preferred mechanism to get the information to Congress?

That is a tough question. Who wants to go first? Dr. Peha?

Dr. PEHA. Well, one issue I have been following, both inspired and horrified by 9/11, is communication systems for first responders, firefighters, police, National Guard. There have been hearings on this topic in a variety of committees, on both the House and Senate side, where I have seen people come in and say here is the little piece of the problem that I see, and here is the incremental change that would help me deal with it. And that is great, but that doesn't allow you to look at the whole problem, and one of the reasons we are in the mess we are in is because the problem has been fragmented so many ways, with each organization looking at its little piece. And another problem is that sometimes, incremental change isn't the way to go, and——

Chairman BOEHLERT. How would you address that particular one?

Dr. PEHA. I think—I mean, a study that came in and said here are a variety of options, and some of them are incremental, and some of them are, you know, some of them are to do nothing, some of them are to beef up this and to beef up that. Others are to look at more fundamental kinds of change. In this case, I in particular think that we have to stop looking at municipally-led systems, tens of thousands of them, and start looking at broad regional and national systems.

And to study the technical, economic, organizational impact, you would need some other kind of organization to look at something that broad, and to compare it to the other incremental approaches.

Chairman BOEHLERT. Well, would the Academy be able to fill that gap, or would you create a new vehicle, and——

Dr. PEHA. I think the—I mean, the Academy has also looked at parts of this. They also, because, you know—Peter and I were talking about this exactly before, they have to bring together people who will come to consensus, and they have been looking at all the neat little technologies that they could use incrementally to advance what people are doing. But to look at something radically different, it is very difficult for the Academy to do.

And you know, you could look at something radically different and say it is the wrong idea, but to come along and say here is a very different choice. Here is what would happen if the Department of Homeland Security took the lead, instead of city governments. That would have to come from somewhere else.

Chairman BOEHLERT. Do you have an idea where that somewhere might be?

Dr. PEHA. Well——

Chairman BOEHLERT. Should we resurrect OTA, for example? Did that pass your four——

Dr. PEHA. Yeah. At the moment, frankly, Carnegie Mellon University is trying to look at this, but we are too far removed. I would like to see some organization that answers directly to Congress, that is—has staff that are, you know, that answer only to Congress. They may do some of the work themselves. They may farm it out to—pieces of it out to consultants, as Congressman Rohrabacher suggested, but ultimately, they would put those pieces together. They would negotiate with Congress what they are supposed to do, and they would present it to Congress when they are done.

Chairman BOEHLERT. Thanks. Dr. Teich, do you have an observation you would share with us?

Dr. TEICH. Well, I can—I could say what he said, that I like, but I think—pick a different area, pick energy conservation, for example. That is an area in which there are a huge number of existing studies. There are a wide range of views on how to accomplish it, but we are very far from having a systems point of view on that, and of implementing programs on a sufficient scale to accomplish what we need to accomplish, I think.

So, what Congress needs is some kind of mechanism that will synthesize the knowledge, and will give it ownership of a set of ideas that will satisfy the diverse needs that conflict in this—in that kind of an arena, the various companies that have a vested interest, the other organizations. And to take the scientific data out of all that, and put it in a framework that Congress can look at and can use.

Chairman BOEHLERT. With all due respect, in that particular example you are using, energy conservation, we are not short on getting good science up here. We just don't want to accept it. We ignore it.

Dr. TEICH. Well, I am——

Chairman BOEHLERT. You know, we like to say we are for scientific consensus, until the scientific consensus leads to a politically inconvenient conclusion. Then we want to go to Plan B.

Dr. TEICH. Right.

Chairman BOEHLERT. The sciences—for example, one of my pet causes, CAFE standards. We have got off the shelf technology, don't have to launch a new research program, off the shelf technology that could be employed that would save us, you know, millions of barrels of oil at a time when we are so dependent on foreign source oil. Pretty logical, but you have people questioning the science. Not—scientists questioning the science, you have policymakers, so the problem, the frustration I have is that you can lead a horse to water, but you can't make him drink sort of thing. And we have got the good science there, in this area particularly, and we ignore it, because it is not politically convenient to address the good science in a meaningful way. But——

Dr. TEICH. I guess that was the point I was trying to make, and perhaps not as well as I would have liked, but Congress needs an institution that will help it to drink in this case.

Chairman BOEHLERT. Well, but once again, you get—the institution, whether it is a reconstituted OTA or any other sort of think tank, objective, impartial, independent, adequately funded. You can have, you know, hordes of people with—spending tens of millions of dollars, but when they present something to Congress, Congress has to make policy decisions, and not science decisions. All the science is there to prove the point, but so many people ignore it, unfortunately.

Dr. Blair, you are going to answer your own question?

Dr. BLAIR. Yeah, if you don't mind.

Chairman BOEHLERT. Well, that is fine.

Dr. BLAIR. I would like to offer an example that may illustrate the gap I described. I mentioned in my written testimony, but I didn't describe in detail, I think, an example of the kind of gap I am talking about.

Out in California right now, we are in the middle of rolling blackouts in some parts of the electric power system, and there is a lot going on in the electric power industry right now, and where the future is headed.

We at the Academies are very well suited to look at, for example, producing an authoritative set of recommendations for making the power system more secure and reliable in the wake of blackouts and the threat of terrorist attacks. In fact, we are doing that study right now for the Department of Homeland Security. However, we are not looking at, for example, a way in which the electric power system might evolve over the next decade with the pressures of increasing competition, how it has worked or not worked in different parts of the country, how the role of technology is affecting our ability to install new generation in different parts of the country, the social, economic, political, and other dimensions where it is almost impossible to achieve a consensus, but it is important for Congress to have the context of those issues laid out in a way that helps inform the debate, in a realistic way, which is very important.

Chairman BOEHLERT. What would you suggest—what would be the vehicle to carry that forward?

Dr. BLAIR. Well, I laid out a few of the options in the—in my testimony, that I suppose the Academies could evolve in that direction. We are currently not now constituted to do that very well, because as Al mentioned, we are designed to come to scientific consensus on committees, come up with consensus findings and recommendations. That would be almost impossible in this kind of an argument.

So, having a body that could do this, directly tuned to the needs of Congress, is important. It could happen in a variety of ways, anywhere from resurrecting the function that was provided by the former Office of Technology Assessment, to perhaps modifications in some of the existing Congressional agencies, to perhaps even adapting some mechanisms outside the Congress, but directly reportable in Congress.

Chairman BOEHLERT. I have far exceeded my time, but Dr. Hunt, do you have something special you would like to offer?

Dr. HUNT. What I would say is, the way I like to approach this in industry is to put out a grand challenge, or in any case, some-

thing where you look and say, how could that possibly happen? Like, let us cut gas prices by a factor of ten, or a factor of a hundred, or let us just go non-petroleum. What would it take to do that?

And the reason you start with something like that is it makes you think out of the box. It makes you come up with solutions you might not be able to come up with looking at standard reports. And where I would say this would take you would be to look at energy policy, right. If we had an energy policy that looked at short-term, long-term, mid-term types of capabilities, and I think there are a lot of reports out there, as you have said, there is a lot of information. How do you assimilate that together and put forward an energy policy that will truly decrease our dependence on foreign oil?

And it takes what we call at work institutional fortitude, right, there are things and—that are not politically acceptable, but the question is, can we focus with the end in mind, and develop a place where there is an independent body that can provide choices.

Chairman BOEHLERT. Thank you very much. I apologize to my colleagues. I went way over my time limit.

Mr. Gordon.

Mr. GORDON. Thank you, Mr. Chairman. It was a good area of inquiry.

I am one that thinks that Congress needs additional nonpartisan, independent scientific information. I think it will help us make better decisions, and I think it will help us use the taxpayer's dollars more wisely. And so, let us—I want to get more specific than sort of the wide-ranging discussion we have had so far.

There are some that think that after the November elections, that the Congressional horse might be more willing to drink, and if that occurs, then let us again be more specific. One approach would be, OTA is already authorized. It is just not funded. And so, my question would be what are the pros and cons of properly funding and staffing OTA to accomplish the goals that we had been talking earlier, and I will let each witness try to succinctly give us an opinion on that.

And why don't we do it in reverse order this time.

Dr. HUNT. So, I think—sometimes, I think that it is important to change the name of something, so that indeed, you don't go back to what you had before, but that you look at what the qualities are that you want in the future.

And I think that you heard a lot of summary of that here this morning that I think you would want to go back to. It needs to be bipartisan. What you are——

Mr. GORDON. Yeah, but I—my sincere question is——

Dr. HUNT. Okay.

Mr. GORDON.—is what are the pros and cons of appropriately funding OTA? It is already authorized. What are the pros and cons of doing OTA?

Dr. HUNT. Okay. I would say one of the pros is, it would be expeditious, okay. It would be something you could do and put in place quickly. What I think one of the cons would be is that you would want to make sure you construct it, not just revive it as it was, but construct it to address any issues you felt that were not appropriate, or not satisfactory.

So, if timeliness is important, you need a process that will direct timeliness. If choice of projects is important—am I going down the road you——

Mr. GORDON. Not really, but we will go to Dr. Blair.

Dr. HUNT. Okay.

Mr. GORDON. Let us see if he can get down there.

Dr. BLAIR. Well, this may be context, but I have either the distinction or the misfortune of being the one who literally turned the lights out at OTA, and handed the keys over to the Architect of the Capitol, and I think that, as I think back, at the time of OTA's closing, and what OTA would look like now, I think it would be a very different place.

A lot has happened in those 10 years. The way in which people communicate with Congress, the day-to-day operations, perhaps the—at the time OTA was closed, the ability to react more nimbly, to provide interim results to major assessments, to interact more with the broad individual membership of Congress, in addition to the committees. All of these are things that were sort of on the table at the time, but in the flurry of the decade ago, didn't have time to mature.

So, on one hand, yes, the pros are that the function exists. It could be started up again, but I think it would have to be a different place. The function is quite clear, and I think OTA could do it. Perhaps some of the other experiments that are going on, such as the enhancement of the GAO technology assessment experiment, or perhaps, the idea of building a function like this within the Congressional Research Service. But there are cultural changes that would be necessary there in order to really appeal to this function we have been talking about.

Mr. GORDON. Well, you are starting from scratch.

Dr. BLAIR. Yes.

Mr. GORDON. So, it is not a matter of having, I don't think, those liabilities.

Dr. BLAIR. Right.

Mr. GORDON. In terms of updating it, you can trade in your manual typewriters for computers, and you can also recognize you are dealing in a different age.

Let us see, Dr. Teich.

Dr. TEICH. Well, I think the pro is obvious, and has been identified by my colleagues, which is that it would be the easiest route legislatively, since you would not need to pass new authorizing legislation to establish it.

I think one of the cons is the legacy of—which may not be such a major consideration at this point, since I think many of the people who were involved in the decision on OTA are no longer in the Congress, and a lot of others have, perhaps, forgotten that the issue existed. But I think that is also one of the problems, which is—that needs to be addressed in creating a new function, and I don't know what you call it, and I don't have a formula for establishing it, but too many people in the Congress, too many Members, I think, didn't really care. It wasn't that important to them. It didn't serve them sufficiently, and I think that somehow, a new function has to be created that would serve the Congress more broadly than OTA did.

OTA tried. It didn't have the resources, I think. It never established the kind of presence in the Congress that made it indispensable. It needs to have that kind of presence. It needs to have a connection to a wide range of committees, and to a wide range of Members.

Mr. GORDON. I think to some extent, it was the victim of a drive-by shooting in '95. There was an interest to take a scalp, and it was a handy scalp. Do you want to finish up, and then we will move on?

Dr. PEHA. I agree with everything that is said. If it would be easy, and if that method is used of creating an organization, it would have to be understood that it is not reviving OTA. It is creating a new organization in that shell, that would look different, and learning the lessons of OTA.

But let me put this in the context of the alternative. The alternative is to create this function, or to establish this functionality in an existing organization, like GAO, Library of Congress, or CBO. That has advantages, in that you can share resources, particularly if you are establishing something that is initially not all that large, as large as OTA was in the earlier days. Establishing something in a new organization would have the disadvantage that you have a dissimilar existing mission, and you would have to protect the new activity from the old, it would, you know, it would have to have different processes. It would have to have staff with different skills, and you would have to make sure that there was sufficient independence in this new piece.

Or one other option, you create a standalone agency that looks, that, you know, with new authorization, that is whatever the new thing is.

Mr. GORDON. Okay. Thank you, and let me just suggest to all of the think tank folks, you know, that are here. This would be a good area to be thinking about. And that, I think, at least this committee would welcome recommendations, thoughtful papers, on how to set this operation up.

Thank you.

Chairman BOEHLERT. Thank you very much. The ever patient and always persistent Mr. Rohrabacher.

Mr. ROHRABACHER. Thank you very much.

This is one drive-by shooter to the other. Let me note, there is some, you know, although we do recognize that drive-by shooters are bad people, but some people need shooting, you know. I will just have to tell you this, and frankly, when we were trying to get control of Federal spending, this Office jumped out at us as something that needed our attention, it needed to be put in our sights.

I—let me put it this way. What I hear today is the assumption that having something like the OTA reestablished is going to be—it is going to be an objective organization, and it has got to be, you know, all of these great words that are coming up to describe another layer of bureaucracy, and a buffer between us and the scientific world. You are assuming that this is going to be a very positive element, that now we put in place. I don't know what makes you—is there any scientific reason to assume that putting in this new layer of government between us and the scientific community will yield positive things? I don't think so. I mean, every time I

have heard about hiring new government employees, and putting—and letting them be your, you know, one who is going to put it all together and describe to us what is good and what is bad, it has turned out bad.

Let me just note that what we need is not an organization that will serve as a conduit for which everybody has to come to us through. We need competing sources of information. That is what we need, and unfortunately, at some of our own hearings, we don't have both sides. I mean, I think the most important thing that we can do is have people in the scientific community representing both sides of any issue, here, debating it in front of us, and recognizing that no matter how many people speak about what their authority is, there is disagreement among people even in the scientific community about which direction to go on certain issues, on most issues, I might add.

I remember when cyclamates, when I was a kid—Remember cyclamates?—were banned. By the way, they were never banned in Canada, let me note that. But we banned them, and we had terrific scientific information, the entire scientific community eliminated the billions of dollars that our soft drink companies had invested in cyclamates, and we eliminated them, and of course, 15 years later, we found out no, well, we were wrong. Sorry. Cyclamates really don't cause the cancer we thought they would, and of course, in the meantime, we got an obesity problem springing from soft drinks that are being consumed by people without cyclamates. So, anyway, there are—what we needed to hear perhaps, back then, was a competing view on cyclamates, rather than just having one scientific buffer between us.

Finally, let me note, Mr. Chairman, the fellowship programs that have been mentioned today, the AAAS fellowship program, I would like to commend the AAAS, and I would like to make sure that we all know that there are wonderful, wonderful sources for Congress right now that I take advantage of. I have had a AAAS Fellow with my office for the last 15 years, and they have all been superior. They have really contributed greatly to my effectiveness and my efficiency and my understanding of various issues, as well as broadening the amount of sources of information that I have.

These are the ways that we should go. We should be encouraging universities and people to be available to us on a contractual basis, and fast turnaround, rather than well, we will tell you in ten years turnaround. Let us hear an assessment, and have someone who can go through the scientific assessment of what has already been researched, and get back to us with a report in two months, rather than two years. These are the type of things we need. We certainly don't need another buffer between us and the scientific community.

And with that, I would just—anything you would like to disagree with, or say you agree with, go right ahead.

Dr. PEHA. I would agree that you don't need a buffer between Congress and the scientific community, and that, I think, is the last thing this organization ought to do. If you want to go out and reach out to——

Mr. ROHRABACHER. Even though it may evolve into that.

Dr. PEHA. This should simply be another information source, a more objective information source than many that you will get that will help you reach out to those other sources.

Dr. TEICH. Yeah, I would—first of all, I want to thank you for your vote of confidence in the fellows program, both the things that you said, Mr. Rohrabacher, as well as——

Mr. ROHRABACHER. Well, thank you. We thank you.

Dr. TEICH. Well——

Mr. ROHRABACHER. You have done a terrific job.

Dr. TEICH. We—it is a two way street. We benefit from the ability to assist you, I think, and we are pleased that you are appreciative of the assistance that we have provided, as Mr. Boehlert said, the—some of the—many of the Fellows go back to their careers in their universities and other institutions, and serve as points of contact between the policy-makers and the scientific community, and I think it is a very valuable thing to see happening.

And I think that same kind of thing can be created, if it is done right in an institution, such as the one we have been talking about, and I am not talking about reestablishing an OTA, but I am suggesting that some kind of institution does not have to be a buffer or layer or an insulating mechanism. It can be a semi-permeable membrane, if you want to use a scientific analogy. It can be something which transmits information in both directions, and that is the thing, that is the kind of thing I would like to see.

I would add that I think we have plenty of competing sources of information, and I think that is part of the problem.

Dr. BLAIR. Let me give you a California example. It is a buyer's market for houses in California right now. As a metaphor, if you are a buyer coming to look at houses, you can rely on the advice of the realtor, or his friends next door, or many others, but if they really would like to have an objective, independent view, they hire a house inspector to look at the quality of all of the—to be able to dig in the muck and see all of the things that are going on in that house before they buy it.

What you need is a house inspector. You need an organization that can provide this sorting out of all the conflicting pieces of advice, and do it in a way that is trusted to you, to you Members of Congress. And that is my California metaphor.

Dr. HUNT. So, I guess my industrial metaphor would be that when you have something important to do, and in this technology-driven society, I would say technology assessments would be what we would call mission critical, and that would be something that you don't outsource, your mission critical work. You certainly collect outside information, but you have that house inspector that is chartered to get you that information, to synthesize that information, and to present you with the options in the way that you can trust.

Chairman BOEHLERT. Thank you very much, and thank the gentleman. Ms. Matsui.

Ms. MATSUI. Thank you, Mr. Chairman, and I want to thank the panel for being here today.

I have only been on the Committee for about three months, so I am one of those who can look at it as a newcomer, in essence. And I wasn't here 10 years ago at the demise of OTA, but as you

have also said, a lot has happened in ten years, and I think one of you indicated that Members, perhaps, then didn't care about the area of OTA.

Today, however, as I think every single one of you has said, science and technology affects every part of our lives. We brought up last week stem cells, climate, energy. Everything is involved in this, so it is not just relegated in a sense, as being a part of just the Science Committee. So, every committee in Congress can benefit by whatever entity we are talking about here. I also believe that we have a lot of information, almost too much information. Ten years ago, we were barely using email, and today, they are just blasting us all the time. We thought we had problems with fax machines, but that was nothing compared to email today.

And honestly, every single one of us probably has some sort of a personal scientific type of question, whether it be medical or whatever, and usually, the first thing you do is go to the Internet to try to figure it out, and you realize oh, boy, this is not the way to do it. And I think to a certain degree, for all of us here, we would like to be able to manage the information in a way which is independent, accurate, and timely, and I think all those things have to be factored in. I even believe that my very committed and very passionate California colleague would also like to see that, too.

We are all so very busy, and if it would be great for all of us, every single one of us in our districts have—we are from California, obviously, here. We have an energy crisis. We know that. It is 109 in Sacramento, and it is too hot, and gases are too expensive, and all that. So, science touches us everywhere. So, every single one of us has a need for some information, and we just can't go to the Internet. We can't just kind of look into the books, or go to the Academies. That is too much information. So, we need something of the caliber that we are trying to figure out here.

Now, is it possible, as we are talking about, to restructure this OTA, rename it, and come up with a different type of—the same mission, but perhaps more relevant to today. Because my feeling is, is that you brought up net neutrality. I mean, those of us here, I have a little bit of knowledge of it, but I didn't think that it was what was portrayed, and either, you know, you see the advertisements or hear it, and it is not quite what I thought it was going to be.

So, therefore, there is a real need, but it is a need, as my colleague says, this needs to be information that has to be given to us very quickly, and most of the time, we hear from the people who come to see us with their particular advocacies.

So, I am trying to figure out, is there a way to do this, so that we have adequate, accurate information. Maybe there is a system set up where there are hot issues that you can deal with, and other types of issues that are more lengthy and study. Can we do that in a manner which can address some of the concerns that Mr. Rohrabacher has, and that I would have, as far as independent, accurate information? I like to hear debates, but you know, you can get tired after a while, and you don't come back with that much information. I would like to have somebody give me good information.

So, each of you, could you respond to that?

Dr. TEICH. Well, I think you have identified the problem very succinctly, and I would answer in response to your basic question that yes, it is possible to do this. I don't think we are going to decide exactly how right here and right now, but I think what is necessary initially is a recognition, and a recognition among a majority of Members, that it is necessary to have this kind of function.

And then, I think the kind of information that you need that will help you establish this in an effective way can be generated through additional hearings, through staff studies, through outside contributions, but a variety, there are a variety of mechanisms that will assist you in developing this. But first of all, you need to recognize that it needs to be done.

Dr. BLAIR. In thinking back ten years ago, as I mentioned earlier, the centralized organization in the Congress would probably be a very different place now. But one of the things that struck me at that time, and even now, perhaps more, even more current, is an ability to collaborate among the Congressional support agencies. For example, CRS is very good at the off-the-shelf kind of analysis, the ability to give you the very quick answer. The former OTA was designed for the comprehensive, large scale assessments. There is a lot of room in between those two extremes. And is there an ability to network the organizations in the Congress, like the General Accounting Office, the Congressional Budget Office, CRS, and perhaps a new function that resembles the function of the old OTA, to provide a whole that is more than just the sum of the parts, to be able to react to that network of activities?

And actually in my paper, I talk a little about some of the experiments that are going on now. For example, the GAO experiment, where partnering with outside organizations, as well, for example, the Academies now have a relationship with the Government Accountability Office, to use our Rolodex to get experts to come in and convene and provide meetings of experts, to help inform GAO investigations. So, an ability to combine the strengths of multiple organizations has benefit, I think, for having a whole that is greater than just the sum of the parts.

Chairman BOEHLERT. Thank you very much. The gentlelady's time has expired.

Dr. Bartlett.

Mr. BARTLETT. Thank you very much.

For the past 18 months or so, I have been involved in a dialogue on energy in this country, and a lot of people are now engaged in that dialogue, a lot of very bright people, and sometimes, equally ignorant people are engaged in that dialogue.

And we have a number of questions of fact for which we need answers, and I have two questions to ask you, and I will mention a few of those. I would like to know are these the kind of things that we could reasonably expect an OTA-like organization to give us answers to? And after that, where should we go now?

One of these is the amount of fissionable, the uranium that remains in the world. If we are going to move to light water reactors, how much fissionable uranium remains in the world? I get widely divergent answers to this, like 15 years and 100 years. Where are we?

The energy profit ratio of ethanol. Some believe that more fossil fuel energy goes into producing ethanol than we get out of ethanol. Clearly, if we are going to have a debate on where we go, we need to have an answer to this. To whom do we turn for that answer?

If there is a positive energy profit ratio for ethanol, is it reasonable that we could displace a meaningful amount of our gasoline with ethanol? Brazil now has no foreign oil imports. Of course, Brazil is not the United States. They get their ethanol from sugar cane, which they grow largely with hand labor, and they don't have very many cars and so forth.

If it is true, as I am told, that 13 percent of our corn could displace two percent of our gasoline, and if you had to grow corn using the energy from corn, with a reasonable energy profit ratio, if we doubled our corn crop, one calculation says you would have to double our corn crop and use it all for ethanol, just to displace 10 percent of our gasoline—of how much of our biomass can we rob from our topsoil, and still have topsoil? What is the potential? To whom should we go for an answer?

USGS is using what I think is an interesting, if not bizarre use of statistics, where they take the 50 percent probability, and call it the mean, and using that, they project that we will find as much more oil in the world as all the oil that now remains in the world. Professor LaPierre says that that is just implausible. That just can't happen. But our Energy Information Administration uses this bizarre use of statistics by USGS to tell us that—not to worry about energy, because it just goes up and up into the wild blue yonder, and they—for the foreseeable future, they have energy going up and up when oil is $75 a barrel today.

How much energy goes into producing the oil from the tar sands in Alberta? I am told that they may use more energy from natural gas than they get out of the tar sands. Okay, from a dollar profit ratio, the gas is stranded, but at the end of the day, that may be really dumb use of that energy in that gas. We had an experiment by Shell Oil Company in getting oil out of our oil shales in the West. They freeze a big vessel, then they cook it inside that for a year or so, and then, they pump for a year or so. What is the energy profit ratio there? And I have a lot of trouble believing that it is really a positive energy profit ratio.

And then, another consideration. Maybe we will move to nuclear. You build a nuclear power plant, it takes a lot of fossil fuel energy. For how many years do you have to operate the nuclear power plant before you get any net energy out of it? How many years do you operate it before you get back the energy you put into building the plant?

Now, are these the kinds of questions that an OTA type of organization could answer for us, and absent that, where can we go now for answers to these questions, because we can't have a reasonable dialogue until we agree on these facts, and there is no agreement.

Chairman BOEHLERT. Now, there is a test. Who wants to go first?

Dr. BLAIR. Well, I can take a crack at some of that. I think many of the dimensions of what you cite—in fact, let me say that my staff, our staff at the Academies, who have been talking with you, Mr. Bartlett, about energy problems, have been very inspired by a

lot of the discussions they have had with you. And I think that many of the issues you describe are issues where a consensus group of experts from, say, the Academies could provide important insights onto questions of, let us say, fact.

But some of them that you described are moving in the direction of choices, and issues that would require tradeoffs in understanding and the like, and it would be more difficult, as I think I mentioned earlier, for the Academies to come to consensus on those kinds of tradeoffs.

For example, one of the energy issues you didn't mention was—well, you did, sort of—on fuel economy of automobiles and gasoline, and there are dimensions of that where, you know, you might raise the issue of whether or not—how far off are plug-in hybrids, or how quickly can the auto industry turn over its fleet to a new generation of vehicles. We can certainly identify the technical potential, but identifying the policy tradeoffs, and how to get there, whether you adopt CAFE standards or fuel taxes, or all kinds of other policy mechanisms—

Mr. BARTLETT. Yeah, both of those, thank you.

Dr. BLAIR. —those are much more subjective and policy rich discussions, but they are very complicated, and very intimately related to the technology. So, many of the issues you described, where the debate hinges on the interface between policy and technology are more in this, the kind of organization we have been talking about.

If you would like to talk specifically about cellulosic ethanol versus grain-based ethanol, and switchgrass, and all of that, I would be happy to do that with you at some point, but there is plenty of room in there for both approaches that we have been talking about.

Chairman BOEHLERT. Thank you very much. The gentleman's time has expired.

Mr. Green.

Mr. GREEN. Thank you, Mr. Chairman, and I thank you and the Ranking Member for hosting this most valuable hearing.

I would like to share a brief vignette that is not true, before I make my inquiry. The story is told of a person who receives information from messengers, and he tells the messengers: "I want your most truthful, your most honest, your unbiased opinion." And the first messenger gives an opinion, and the recipient immediately shoots him. Then he says to the next messenger: "I want your most honest, your most truthful, and your most unbiased opinion." The next messenger says "I agree with you." And he says "But how can you agree with me? You haven't heard my opinion." And the messenger says "I don't need to know your opinion to know that I agree with you."

Now, here is my question. What impact does closing an agency have on the opinions of those that remain behind? When we shut down one agency that gives us information, we have others that take up the task. Are they impacted by the knowledge that we can cease to fund you, and you will cease to exist? Does that color, in any way, the opinions of those left behind? And I am asking this in a sort of rhetorical sense, I guess, because we really are dealing with a question here of how do we have, or give those experts, a

comfort level such that they can truthfully give honest opinions, and not assume that there may be some consequences associated with those opinions that may not be entirely positive?

How do we structure the process, the agency and the process, the methodology by which we acquire the intelligence, such that we get—that what we are seeking, because people understand that they will still be around after they give us opinions that we don't necessarily like?

Anyone want to comment on that? We have—yes. Thank you.

Dr. HUNT. Well, I think any—we learn at an early age that actions speak louder than words, and that if you do something, and there are negative consequences, we learn to modify those behaviors, or sometimes, even restrict those responses.

Now, what you find in some of the best scientists, however, are those people that stick to their guns and have the courage of their convictions, because they truly believe in reporting the science or the data, or the information that they collect as they see it. And I think what we have to do is, we have to do two things. We have to continue to work with those scientists, and we also have to continue to have open minds about information, even when we get it, when it isn't what we want to hear, right.

And so there is really, those are the soft side of relationship skills that this—that we have to work with. One other place we look at that is with funding of science and technology, and if you look at funding going away from the physical sciences, it is difficult to bring students into that realm. But you can also look at that as your opportunity, because if you know that putting the funding there brings the students there, then you know how to make that change. And I am not saying that throwing money at something is the way to make that change, but as you said, by being consistent with your actions, and having your actions follow your words is, I think, the solution to that.

Mr. GREEN. Yes, sir.

Dr. PEHA. This clearly is a problem. Actually, I mentioned a couple of things in my testimony I will expand on. First of all, I think Congress always has to have the ability to defund something that isn't working, but if it takes them a while, then any one particular study that, you know, they won't get shot on the first answer. It will take multiple answers, and one way to do that is to make staff decisions, budget decisions, hiring decisions not annual but longer term than that.

And that still doesn't help if there is a systematic problem, if the organization is always hitting the same group of powerful people who are unhappy. I think if that is happening, it may be that there is a real problem with the organization, or it may be, very likely, a problem with the choices of topics they are looking at, which is why the Congressional oversight is so important, the method of oversight, and particularly, the method of choosing which studies to conduct has to be done in a way that majority and minority and everyone in Congress feels that their issues are being represented, maybe not in every report, but overall, in the long term.

Mr. GREEN. Mr. Chairman, I yield back. Thank you.

Chairman BOEHLERT. Thank you so much. Mr. Holt.

Mr. HOLT. Thank you, Mr. Chairman. As a guest here on the dais, I think I would like to allow all of the Members of the Committee to ask questions if they want, before I take my time.

Chairman BOEHLERT. How gallant of you. Ms. Jackson Lee.

Ms. JACKSON LEE. Mr. Chairman, that will allow me just to be able to thank Mr. Holt for his enormous leadership on this issue, and to thank you, Mr. Chairman, and Mr. Ehlers for your valiant effort back in 1995. I was a baby Congressperson, and on this Science Committee, and obviously, now can look back and see the enormous damage that has occurred with the elimination of the OTA.

Dr. Blair, I am going to start with you, as I reminisce about other agencies, such as the GAO, the Congressional Budget Office, and Congressional Research Service. All of them are poised as effective tools to make Congress the real implementator of the will of the people, a knowledge implementator of the will of the people, meaning that as we address questions, fiscal responsibility, understanding the nuances of space exploration, or the nuances of homeland security, or again, trying to make sure that we handle the people's dollars effectively, that we have the arm of research.

Here we are now with an authorized, as I am informed, OTA, but a nonfunded OTA, and in the 11 years since 1995, the world has simply changed. It has changed after 9/11. It has changed as we have a raging debate on immigration, and the issue is technology, technology, technology. And therefore, our guidepost is missing. We just heard Dr. Bartlett speak eloquently about energy, and coming from the oil capital of the world, I am not afraid of the discussion on alternative fuels, because the companies were wise enough to change their name some years ago, they are energy companies. And I have tried to convince them that they will be as prosperous no matter what energy science we attempt to use.

Someone who has had firsthand experience, I believe, with the OTA, and maybe others would comment as well. How much are we diminished because we don't have a corralling entity that can assess, as Congressman Daddario, I think, in his original vision, when former—well, when Mr. Lindbergh came and began to talk about the Earth and ecology, and wanted to be concerned about someone assessing that potential clash, how diminished, how lacking, how much are we undermined because we don't have an agency that is capturing for us either the most innovative technology, or ordering it for the Congress, as these various new either innovations or failed innovations are coming to the forefront? And if you would, give your most honest answer of the restoration of the funding for this as an answer to its present hiatus.

Dr. BLAIR. Well, let me say first that I think that there was a hope when OTA was closed that other agencies in the Congressional complex would be able to fill the gap, and to a limited extent, some experiments are ongoing that may, that are attempting to address that. I think they will get——

Ms. JACKSON LEE. Being very polite, Dr. Blair.

Dr. BLAIR. I believe that the gap is a large one, and it continues to this day, and the—some function needs to be re-injected into the Congressional infrastructure in order to fill that gap. I think we have all expressed that view today.

I do think that a resurrected OTA, as I think I mentioned in response to a thing earlier, a question earlier, would have to be a different place. There would be many different features to it to respond to some of the criticism and shortcomings that happened earlier, and it would have to network, I think, better with the other agencies of Congress to keep pace with the times.

Ms. JACKSON LEE. Anyone else?

Dr. TEICH. Yeah.

Ms. JACKSON LEE. Are we suffering as Americans because of the lack of existence of some entity?

Dr. TEICH. Well, you know, you are asking, what you are asking is kind of an alternative history of the last eleven years, and I happen to enjoy reading alternative history, but I am not very good at writing it, I am afraid. So, I can't honestly say, except to suppose, based on the—what I know about what OTA did during its tenure, that we would be better off today had it continued to exist, and I think it would have been interesting.

If OTA existed throughout most of its life in a Congress that was controlled in both Houses, for most of the time, by the Democrats, it would be very interesting to see how it would have functioned, and what studies it would have undertaken under Republican leadership over the last eleven years.

So, I think it—I can't answer your question, but I can say it certainly appears to me that it would—that we have lost something by its absence.

Ms. JACKSON LEE. Did you want to answer? All right. Thank you so very much. Thank you, Mr. Chairman. I yield back.

Mr. BARTLETT. [Presiding] Thank the lady very much. Dr. Holt.

Mr. HOLT. Thank you, Mr. Chairman. I am pleased with the existence of this hearing, and the progress of this hearing, and I thank the Committee for allowing me to take part in it.

You know, science and technology shouldn't be looked to to provide the answer of what is right. So, you know—and there certainly are occasions—Mr. Rohrabacher mentioned cyclamates—where, in retrospect, science has evolved to different conclusions. That does not mean that we have nothing to learn from science and technology. It does not mean that all bets are off, that they have nothing to tell us, and we should wing it with respect to what faces us.

OTA did not present conclusions. In fact, they were scrupulous about that. They laid out a range of choices, including the constraints that were presented by science and technology, and some people took that to mean conclusions. Now, one of the famous examples, of course, was the idea of a global missile defense, where the OTA pointed out that some of the desired or claimed properties of that were unattainable from a scientific and engineering point of view. That was taken to be a conclusion, when really, it was just, I think, a fairly objective look at the constraints placed by science.

I certainly think that, in answer to Mr. Bartlett's questions about the supply of uranium and the energy yield of ethanol, and all of those other things, if OTA had existed over the past 10 years, we could have expected studies, a study or studies, that would have laid out the range, and assigned some weight to our uncertainties about the range in the supply of uranium, or the energy yields of ethanol, and so forth.

Well, I noticed that the panels, the panelists have been very judicious, I guess I would say, careful, even cautious in making recommendations to us for what we should do in our plight. I have suggested that what we need is something that is permanent, and therefore, not ad hoc, not something that has to gear up each time a study is commissioned, that it be professional, in other words, it would consist of professionals in this permanent, full-time staff that command the respect of the S&T community, and also, in the sense, professional, meaning that it would be scrupulously nonpartisan. And I would argue that, by the way, that OTA probably would not have behaved any differently under Republican leadership than Democratic leadership because the advisory board was scrupulously bipartisan. That we need something that would be in-house, and by that, I mean it would speak our language, it would understand our processes. It would lay out things, the choices before us in a way that is relevant, legislatively relevant.

And also, something that hasn't been discussed this morning, something that would be part of the life of the Hill. When you have got 100, more or less, professionals who are mingling with the staff, are here and there day in and day out, it elevates the debate. Even if they have not yet completed their result, their report, even if they have not and never will come up with a policy conclusion to help us in our job, they are part of the life of the Hill.

So, you know, when Harry Truman said he longed for a one-armed economist, who wouldn't say on the one hand and on the other hand, let me ask you to raise only one hand, and say do you agree that we need something as I have just described, that is permanent, professional, in-house, in order to provide what we need?

Dr. BLAIR. Can I——

Dr. TEICH. Yes.

Dr. BLAIR. Can I elaborate on——

Dr. TEICH. I am sorry.

Dr. BLAIR. Please.

Dr. TEICH. And I think I would add, as you implied, bipartisan, as well.

Mr. HOLT. Well, in fact, when I say professional, that—I mean both commanding the respect of the S&T community, and scrupulously nonpartisan or bipartisan.

Dr. BLAIR. One aspect of what you describe, I would like to elaborate a little bit more on, which harkens back to the OTA days, but also could be possible in other venues as well, and that is this notion of a shared staff. The idea that in the course of an assessment—I remember vividly the one we were doing on increased competition in the electric power industry at the time—that constant interaction throughout the course of the assessment with Congressional staff was very important to help the committees of jurisdiction and interest in really understanding all of the information that was coming before those committees at the time.

And they build up a body of expertise, a current, comprehensive body of expertise that could be called upon in the course of those kinds of deliberations. So, that is a resource that is often not cited in the kind of organization we are talking about, but this notion of a shared staff is a particularly important one, I think.

Mr. EHLERS. [Presiding] Any other comments? I didn't see any right hands go up.

Dr. PEHA. I think that we need something that is permanent. We need something that is professional, and we need at least a piece of this to be in-house. I also think in the last decade, everybody else in the world has learned how to move workflows around a lot better than we used to, and we could perhaps make better use of universities and think tanks and others things than we used to, but everything should flow through something that is in-house.

Mr. EHLERS. Dr. Hunt, did you have anything to add?

Dr. HUNT. I agree. I say yes. This is what we need, and we need the scientists to be nonpartisan.

Mr. EHLERS. Thank you. I would just comment.

Mr. HOLT. So, I would suggest, Mr. Chairman, we could call it this permanent, professional, in-house organization, we could call it TAO, OTA, or we could call it, if we wanted to feel our oats, OATS, the Office of Assessment of Technology and Science.

Mr. EHLERS. I see that you have given this some thought. Well, I feel like the Terminator, because I walked in the door, and someone said could you—can you chair it and terminate the hearing? I don't know if everyone else gave up. I apologize. I had to leave for another urgent meeting, which went far too long, and I lost my temper. But other than that, I am back here. I will not ask any questions, because I missed most of the testimony.

I—just a couple of observations. First a quick one. Being professional does not ensure bipartisan. I am a professional, and I am a Republican. And Mr. Holt is a professional, and is a Democrat, or professes to be. It takes more than that to guarantee——

Mr. HOLT. It is nice to see the physics caucus on the dais.

Mr. EHLERS. Yes. Well, we have a bipartisan physics caucus. And so, being bipartisan means you have a balance of views represented, and I—there are—I was here when OTA was killed, and as far as I can discern—and I opposed that—as far I can discern, their two items were lack of rapidity in replying and, secondly, the Republicans had a feeling that the Democrats used it to their own advantage, which would not be too surprising, because they had been in power the entire time it existed. In a sense, if we are going to do anything, we have to overcome that perception, because the perception is still there. It is not as strong as it was, but the perception is still there.

We have made do, not particularly well, but not particularly badly, either, by getting our rapid advice from CRS and our long-term advice from the National Academies, which is not all bad. But if we are to have something in-house, we have to be aware of the history, and design a program that assures that we do not have the faults, real or perceived, of the predecessor.

And I have talked to Dr. Holt about this a number of times, also Congressman Amo Houghton, when he was here. He was an avid fan of it, and he and I had joined in trying to stop the slaughter, when it was killed. But it was killed, and we have to face that, and we have to come up with something that is a new, improved model, and that really has some advantages. I think there are huge advantages to having such an organization. It is not self-evident, however, to nonscientists, non-technical people.

Another solution, of course, would be to give the Science Committee jurisdiction over everything in this august body that relates to science, which would decimate a few other committees, and who would not willingly give up jurisdiction. But that would be an improvement, too, because I think we in this committee tend to handle things rather professionally, and reasonably, most of the time bipartisanly.

So, with those comments, I will say more power to Mr. Holt and others who are working on this. But I think the difficult problem, two difficult problems. One is designing a system that is going to work well. Second, even more difficult problem, is selling it to the Congress, and I think it is going to take a lot of combined work on all those who are interested, both inside and outside the Congress, to make that come about.

With that, I am pleased to thank you for your input. You have been very helpful to us in the things you have said and the background from which you say them. And I thank Mr. Holt for repetitively raising this issue. He is much younger than I, and therefore, he will probably survive in this atmosphere much longer than I do, and so, I am going to leave the task on his shoulders. And I will be in a supporting role as much as I can.

With that, I am pleased to declare the hearing adjourned.

[Whereupon, at 12:12 p.m., the Committee was adjourned.]

Appendix 1:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Hon. Rush Holt, a Representative in Congress from the State of New Jersey

Q1. Dr. Holt, as a scientist and a politician, please discuss, in detail, your perspective on the state of scientific and technological assessment and advice for Congress.

A1. The state of scientific and technological assessment and advice for Congress is not where it should be, given the number of issues we consider each day that contain scientific and technological components. Technological assessment is the evaluation of new results considering not only technical details but also the implications of the various policy choices implied by the technology. When we discuss scientific and technological assessment for Congress, we include benefit and risk analysis, as well as the transition costs. An example includes the management of the transition of the conventional switch-line telephone system to using the Internet for phone and other communication methods such as e-mail.

Congress recently dealt with such issues as health care, missile defense, and net neutrality, each of which has technological components. Not so obviously, issues like pension reform, technical education, first responder issues, and voting reform each have a technical component as well. Committees hold hearings on these topics, sometimes, however, without addressing the scientific and technical components. Members of Congress may or may not recognize the technological aspects of an issue and obtain necessary advice or assessments. Congress itself lacks an organization to complete analysis on the scientific and technological components of a bill.

Congress does have non-partisan and objective organizations designed to answer certain types of questions. We have the Congressional Research Service (CRS), for example, which is designed to research and report on all legislative issues, and provide answers rapidly. CRS is an excellent resource for Congress. They provide non-partisan, objective, comprehensive, and reliable research on legislative issues in a timely manner for Congress. We also have the General Accountability Office (GAO), which serves the Congress by assessing the effectiveness of government spending. The Congressional Budget Office (CBO) provides Congress information and estimates to guide budgetary decisions. Yet, none of these bodies is chartered or equipped to provide in-depth scientific and technological analysis to the Congress.

There are organizations outside the infrastructure of Congress that do provide scientific and technological assessment and advice. The National Academies of Science (NAS) brings together committees of experts in areas of scientific and technological endeavors to address critical national issues and give advice to the Federal Government. This advice usually comes in the form of reports, and the advice within these reports—depending on the topic and mission of the committee of experts—may include advice based on technological analysis. Most often, NAS reports are based on the opinions and expertise of the members of the committee, and the NAS goes to great lengths to ensure that there is no conflict of interest for any committee member. This process, both necessary and appropriate, increases the time of completion of the Academy reports. Given the often rapid pace of legislative decision-making, the Academy reports frequently fail to reach Members and influence the debate. These reports are not usually directed specifically for the use of Congress, and they are not written with an understanding of familiarity of the needs, the language, and the procedures of Congress.

Similarly, scientific and technological professional societies work to advise Congress. Unlike the work of the Academies, however, we must recognize that professional societies work for their members, and their advice may not always be politically neutral. Additionally, professional societies also do not necessarily provide technical or policy analyses for Congress. The same is true for researchers in academia, industry or in public-private partnerships.

Until 1995, the job of providing objective and authoritative analysis of complex scientific and technical issues to Congress fell to the Office of Technology Assessment (OTA). The OTA was designed to produce scientific and technological analysis for Congress and to serve as resource to Members of Congress and their staff. In its twenty-three years of existence, the OTA issued 703 reports on topics ranging from substance abuse to nuclear war specifically for Congressional needs. OTA's structure included a Technology Assessment Board (TAB) composed of six Senators and six Representatives, with the chairmanship and vice-chairmanship alternating between the Senate and House each Congress. The OTA also had an Advisory Council of ten eminent citizens from academia, industry, and other institutions outside the Federal Government, appointed by the TAB. Statutory Members of the Advisory Council included the Comptroller General of the U.S. and the Director of the CRS.

Chairmen and Ranking Members of committees could request work personally or on behalf of a committee member. The OTA staff and Director then reviewed these requests to determine whether the OTA could provide the information effectively and whether the interest was broad and bipartisan. During the course of the study, the OTA assembled an advisory panel of stakeholders and experts to ensure that the study was objective, fair, and authoritative. However, no attempt was made to reach consensus amongst the panel members. This ensured that differing views were not stifled. Less formal advisory opportunities were also sought with other outside experts and advisors.

For a more detailed explanation of the assessment process, please see Appendix A: The Assessment Process, downloaded from *http://www.wws.princeton.edu/ota/ns20/proces_f.html*

The OTA evolved over time, restructuring and reorganizing to meet Congress' changing needs. In the end, the OTA employed 143 people and had a budget of $20 million. Not only were lengthy studies completed, but also shorter works as committee staff and Members requested or as OTA staffers perceived an upcoming need. In Appendix B, I have included some of the budget justification statements by the OTA to illuminate its impact on legislation and the workings of Congress.

In 1995, Congress voted to defund the OTA. In doing so, Congress lost the body that crafted reports relevant to the scientific policy issues at hand. It also lost insight into the interdependence of various technical aspects of a complex problem, implications of policy decisions, and options available to provide policy-makers. The OTA's work was credible, thorough, and fair. Its absence has left a gaping hole in our ability to understand and address thoughtfully the complex scientific and technical aspects of the issues we face every day.

Q2. Dr. Holt, given your perspective, how would you improve the current process or implement a new process for Congress to receive scientific and technological assessment and advice?

A2. The Office of Technology Assessment (OTA) is the place to start when considering what Congress needs to do to improve the scientific and technological assessment and advice it receives. The OTA completed authoritative, thorough studies, many of which are still relevant today. Studies were initiated through the request of a Chairman of any congressional committee. This request could be on behalf of the Ranking Member of the Committee or on behalf of a majority of the committee, and many requests were supported by more than one committee. The OTA Director and staff then determined whether the interest of the request was broad and bipartisan, and whether the OTA had the resources to complete the study. The request was then sent to the Technical Advisory Board, a bipartisan, bicameral board of twelve Members of Congress, which determined whether to proceed or not with a study. In addition, the OTA had an Advisory Council, composed of ten eminent citizens from academia, industry, and the Federal Government to advise the OTA.

Once a study was approved, a comprehensive advisory panel of technical and relevant stakeholders was assembled to ensure the reports were objective, thorough, fair, and inclusive of a diverse set of viewpoints. A core team composed of OTA staff, contractors, and consultants was assembled with an experienced project director selected, along with contractors and consultants. Each report was subject to an extensive formal review process that included OTA staff and outside experts. Once the assessment was approved by the OTA Director, copies were sent to the members of the Technical Advisory Board for review and authorization. Approved reports were then released, with copies going to the requesting committee or committees. Summaries were sent to Members, and then released to the public. Often, delivery of the report's content followed channels such as congressional briefings, hearings, and follow-up consultation between the OTA and congressional staff. Many of the studies are still available online.

To further illuminate the successes of the OTA, I have included (in Appendices B–K), the OTA Justification of Estimates for Legislative Branch Appropriations from 1987–1996. Beyond its service as a shared resource for the committees of Congress, the OTA interacted with staffs of other federal agencies within both the Legislative and Executive branches, as well as with the private sector and universities. For example, OTA reports were often cited as justification for actions of agencies. The OTA also participated in workshops, interagency working groups, and commissions. It provided its expertise to organizations such as the National Governor's Association, the Council on Competitiveness, and the National Academies of Science. In each Justification found in the Appendices B–K, one can find a yearly summary of this interaction with federal agencies, universities, and the private sector.

Additionally, the Justification of Estimates found in the Appendices B–K, included a summary of the direct legislative use of each OTA division's work. Reports were

often used as background material for legislative activities, used in debates on bills, referenced during or the focus of hearings or testimonies, and assisting in the drafting of legislation. OTA recommendations are often cited as aspects of bills moving through the Senate or House. Conversations and discussions with Members of Congress or staff are also cited in conjunction with work on particular legislation. The OTA was an integral part of the legislative process in both the Senate and the House of Representatives.

We no longer have the OTA. As a result of the OTA's demise, Congress lost not only its own scientific and technical assessment body, but the resulting broad interagency collaboration, coordination, and outreach that the OTA also provided. The operation of OTA was not expensive, but considering the cost of ignorant mistakes of policy, OTA would have been a bargain at several times the cost. Ill-informed decisions result in huge amounts of financial waste. In order to be fiscally responsible, we need a body to give us scientific and technological assessment. Currently, the bodies which serve Congress, the CRS, the GAO, and the CBO, do not have a mission focused on scientific and technological assessment and its implications.

As we look to meeting the scientific and technological needs of Congress, I believe the in-house, professional, permanently staffed body needs to reflect much of the structure and function of the Office of Technology Assessment. It served Congress well. However, in seizing this opportunity to strengthen scientific and technological advice, we must be sure that any new entity meets certain criteria.

Scientific and technological assessments require objectivity and political neutrality. We naturally expect the CRS, the GAO, and the CBO to handle assignments at the same professionalism, and there is no reason to believe that an updated OTA would not maintain the same high standard.

Studies must be timely and relevant. By crafting a management structure to accommodate both longer term studies of topics and studies to be completed on a shorter time scale, this new body can help ensure that Congress makes informed, well-reasoned decisions. A way to achieve this is to enable Representative or Senator to request a study. This not only broadens the perspective and usefulness of the entity, its also reduces the possibility of partisanship, since both parties can make requests independently.

Some have suggested building this capacity into the GAO. This idea is not without perils. For example, the Comptroller General would most likely maintain final say on the studies completed, negating the bipartisan decision-making structure that Members of Congress have said they want. The same danger exists if the entity is placed within the CBO or CRS. Budget concerns would also become an issue. When money gets tight, the scientific and technological assessment group could be the first cut, given that scientific and technological assessment and analysis do not fall within the missions of the GAO, CBO, or CRS. Would I take this scenario over nothing at all? Yes, with appropriate negotiating. Is this scenario ideal? No, it is not.

It is time that Congress take action to give itself an in-house, permanently and professionally staffed body to complete scientific and technological assessments. When OTA existed, other countries came here to learn about the OTA with the purpose of creating such a body for themselves. We were the world leader in this arena, and we can be again.

U.S. House of Representatives
Committee on Science
Hearing On
Scientific and Technical Advice to Congress

Witness:
Congressman Rush Holt

Questions For the Record

Appendix A

Description of the Office of Technology Assessment Assessment Process

Obtained from: http://www.wws.princeton.edu/ota/ns20/proces_f.html

OFFICE OF TECHNOLOGY ASSESSMENT

CONGRESS OF THE UNITED STATES

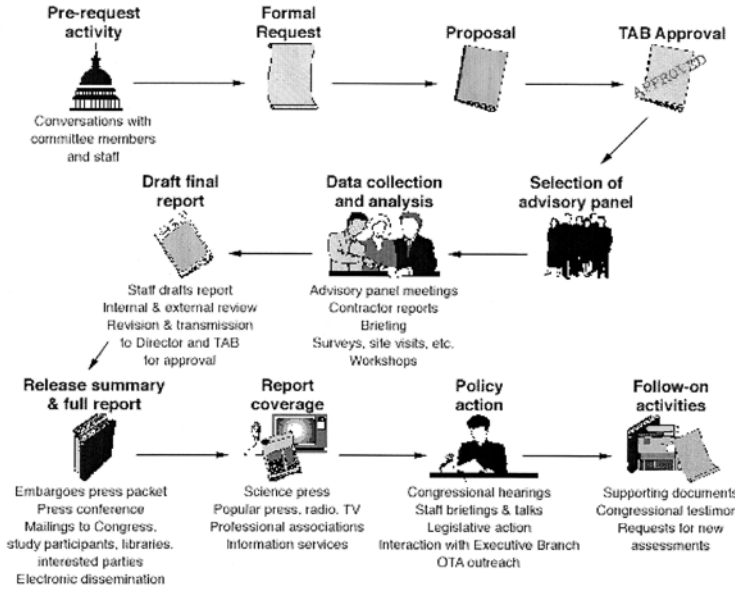
The Assessment Process

OTA was governed by the congressional Technology Assessment Board (TAB). TAB was made up of six Senators and six Representatives with equal representation from each party. The chairmanship and vice chairmanship alternated between the Senate and House in succeeding Congresses. The Technology Assessment Board appointed OTA's Director for a six-year term. An advisory council of 10 eminent citizens from industry, academia, and elsewhere outside the federal government were appointed by the TAB to advise the Agency. The Comptroller General of the United States and the Director of the Congressional Research Service served as statutory members.

Preparing the Reports

The bulk of OTA's work centered on comprehensive assessments that took one to two years to complete. OTA undertook assessments at the request of the Chairman of any congressional committee. The Chairman could request the work personally, on behalf of a ranking minority member, or on behalf of a majority of committee members. The Technology Assessment Board could also request work, as could the Director. In practice, most studies were requested by the Chairman and the Ranking Member of a Committee, and many were supported by more than one committee.

OTA staff reviewed requests to determine whether resources were available, whether OTA could effectively provide the information, and whether interest was broad and bipartisan. The OTA Director submitted proposals to the Technology Assessment Board, which made the final decision on whether to proceed. The TAB reviewed all major studies prior to release. The chart below illustrates the major steps in the assessment process:



The research and writing of the assessments was conducted by the OTA staff of about 200, of which two-thirds were the professional research staff. Among the research staff, 88% had advanced degrees, 58% with PhD's, primarily in the physical, life, and social sciences, economics, and engineering. About 40% of the research staff were temporary appointments of professionals recruited specifically to staff ongoing assessments. For specific information or analysis, OTA also contracted with key individuals or organizations. Contractors analyzed data, conducted case studies, and otherwise provided expertise to complement staff capability.

Public Participation

OTA worked to ensure that the views of the public were fairly reflected in its assessments. The Agency assembled an advisory panel of stakeholders and experts for each major study to ensure that reports were objective, fair, and authoritative. These panels met two or three times during a study. They helped to shape studies by suggesting alternative approaches, reviewing documents, and critiquing reports at the final stages. No attempt was made to develop consensus among panel members; in fact, a wide diversity of views was sought. OTA retained full responsibility for the content and conclusions of each report. In all, nearly 5000 outside panelists and workshop participants came to OTA annually to help OTA in its work.

In addition to the advisory panel, many people assisted with the studies by participating in technical workshops, providing information, reviewing documents, or just talking with OTA staff. These interactions helped OTA to identify and take into account contrasts between the perspectives of technically trained and lay citizens; the involvement of people with differing backgrounds and interests greatly strengthened OTA work.

Release of Reports

Each assessment was subjected to an extensive formal review conducted by OTA staff and outside experts. After s completed assessment was approved by the Director, copies of the formal report were sent to the Technology Assessment Board for its review and authorization for release. Approved reports were forwarded to the requesting committee or committees, summaries were sent to all Members of Congress, and then the report was released to the public. OTA assessments were published by the Government Printing Office and were frequently reprinted by commercial publishers.

Research Coordination

OTA worked with the other congressional support agencies—the Congressional Budget Office, the Congressional Research Service of the Library of Congress, and the General Accounting Office—in an interagency Research Notification System. Its purpose was to coordinate activities and exchange information to avoid duplication of effort. Representatives of each organization met regularly, and biweekly status reports were published in a central directory of congressional research activity. Similarly, OTA stayed in touch with the published work and current activities of analysts and researchers in Federal executive and legislative branch agencies and throughout the country.

Structure of the Agency

The Office of Technology Assessment was reorganized periodically as it grew and as the types of technology expertise relevant to public policy evolved. By 1995, OTA was organized into two main analytical divisions, each comprised of three research programs, along with an Office of Congressional and Public Affairs.

Within the *Industry, Commerce, and International Security Division,* the *Energy, Transportation, and Infrastructure Program* was responsible for examining the role of technology in extracting, producing, and using energy resources; in designing, operating, and improving transportation systems; and in planning, constructing, and maintaining infrastructure. It addressed the impacts of these technologies and the factors that affect their

ability to support commerce and other societal goals. Its work also included applications of materials to energy, transportation, and infrastructure systems, including the development of natural and manufactured material resources through extraction, processing, use, and recycling or waste management.

The *Industry, Telecommunications, and Commerce Program* analyzed the relationships between technology and international industrial competitiveness, telecommunications and computing technologies, international trade and economic development, industrial productivity, and related topics. It considered the effects of technological change on jobs and training, and analyzed the changing role of electronic technologies in the nation's industrial, commercial, and governmental institutions and the influence of related regulations and policies.

The *International Security and Space Program* focused on implications of technology and technological change on national defense issues and on issues of international stability, arms control, arms proliferation, terrorism, and alliance relations. It addressed a broad range of issues including space transportation, earth observation, and international cooperation and competition in the exploration, use, and commercialization of space.

The second major OTA analytical division was the *Health, Education, and Environment Division.* Within it, the *Education and Human Resources Program* critically examined a wide variety of technologies for learning. It also analyzed science-grounded human resource topics, including the costs, availability, effectiveness, and impacts of technologies in areas such as long-term care, services and housing for people with disabilities, prevention of drug abuse, and issues of crime and violence.

The *Environment Program* addressed areas including the use and conservation of renewable resources; pollution prevention, control, and remediation; and environmental health and risk management. Its assessments included topics such as agriculture, management of public lands, biological diversity, risk assessment methods and policy, air and water pollution, management of solid, hazardous, and nuclear wastes, and the effects of weather and climate change.

The *Health Program* assessed specific clinical and general health care technologies as well as broader issues of health policy related to or with implications for technology. It also analyzed applications of the biological and behavioral sciences, including biotechnology, human molecular genetics, neurological sciences, and health-related behaviors. The Health Program was also responsible for OTA's statutory methodology oversight responsibilities regarding Vietnam veterans health studies.

U.S. House of Representatives
Committee on Science
Hearing On
Scientific and Technical Advice to Congress

Witness:
Congressman Rush Holt

Questions For the Record

Appendix B

Office of Technology Assessment
Justification of Estimates
Submitted to the
Subcommittee on Legislative Branch Appropriations
1987

Relevant Pages
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OFFICE OF TECHNOLOGY ASSESSMENT

OFFICE OF TECHNOLOGY ASSESSMENT
FISCAL YEAR 1987 BUDGET IN BRIEF
TO THE
~~SUBCOMMITTEE ON LEGISLATIVE~~ BRANCH APPROPRIATIONS

The funds requested represent the best estimate of the Technology Assessment Board of what is required to meet the needs of the 99th Congress.

FY 87 Budget Request:		$17,700,000
Includes: $40,000 for the Prospective Payment Assessment Commission authorized in P.L. 98-21, Section 601		
FY 86 Budget Request: $17,000,000		
FY 86 Appropriation:	$15,300,000	
Sequestered Amount According to P.L. 99-177	(658,000)	
Revised FY 86 Appropriation		$14,642,000
ESTIMATED INCREASE IN FY 87 REQUEST OVER FY 86 APPROPRIATION		$3,058,000
Reimbursable Program SDI Study (P.L. 99-190, Section 101(b)		$700,000

Salaries and Expenses

For salaries and expenses necessary to carry out the provisions of the Technology Assessment Act of 1972 (P.L. 92-484), including reception and representation expenses (not to exceed $3,000 from the Trust Fund), and rental of space in the District of Columbia, and those necessary to carry out the duties of the Director of the Office of Technology Assessment under Section 1886 of the Social Security Act as amended by Section 601 of the Social Security Amendments of 1983 (P.L. 98-21): [$15,300,000] $17,700,000: Provided, that none of the funds in the Act shall be available for salaries or expenses of any employee of the Office of Technology Assessment in excess of 143 staff employees: Provided further, that no part of this appropriation shall be available for assessments or activities not initiated and approved in accordance with section 3(d) of Public Law 92-484, except that funds shall be available for the assessment required by Public Law 96-151.

Reimbursable Program SDI Study

The OTA will conduct a study on SDI, as provided in Section 101(b) of Public Law 99-190:

> "For expenses of activities and agencies of the Department of Defense ... $6,637,386,000 of which $700,000 shall be available only for the purposes of carrying out, through the Office of Technology Assessment, a comprehensive classified study to be submitted to the Appropriations Committees of the House of Representatives and the Senate, together with an unclassified version, no later than August 30, 1987, to determine the technological feasibility and implications, and the ability to survive and function despite a preemptive attack by an agressor possessing comparable technology, of the Strategic Defense Initiative Program ...."

The study shall include an analysis of the feasibility of meeting SDI computer software requirements. (Conference Report No. 99-450, accompanying H.J.Res. 465)

5. OTA's Accomplishments During 1985

During FY 1985, OTA published 19 formal assessment reports, including 2 special reports. As of September 30, 1985, 24 assessments were in progress; 3 were in press or under TAB review. OTA also delivered, in FY 1985, several other assessment-related documents: 2 Report Supplements, 5 Technical Memoranda, 11 Background Papers (including Case Studies and Workshop Proceedings). (See pages 86-99.)

As an integral part of carrying out assessments, OTA also provides, during the course of a project as well as after its delivery, expert advice, briefings, testimony, and results of OTA assessments to Committees in ways matched to their specific needs and the Congressional agenda. (See pages 137-154.)

The reports represent comprehensive synthesis and analysis on some of the most controversial and expensive issues faced by Congress ... covering, for example, waste management, international technology transfer, the future of American agriculture, the technology for defensive weapons, health care cost containment, and the future of biotechnology. These studies directly reflect the expressed needs and priorities of Committees of House and Senate. During the year, OTA delivered services to over 90 different Committees and Subcommittees of both houses, typically in response to bipartisan requests.

Relation of Work to Legislative Activities

OTA's role is neither to promote nor to discourage development or application of any particular technology but rather to help determine whether or when some form of Federal government participation may make sense. OTA helps identify and clarify options; exposes misleading and incorrect information; and helps raise the level of understanding in the debate about expensive and controversial technical issues.

In each section on divisional accomplishments, we identify some activities during fiscal years 1985 and 1986 to date that illustrate the link between OTA's work and Congressional activity. Please see the following pages for this information:

page

Energy, Materials, and International Security Division
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- Industry, Technology, and Employment 32
- International Security and Commerce 33

Health and Life Sciences Division
- Biological Applications 47
- Food and Renewable Resources 48
- Health 48

Science, Information, and Natural Resources Division
- Communication and Information Technologies 63
- Oceans and Environment 64
- Science, Education, and Transportation 64

Interagency Coordination

In carrying out its mission as a shared resource to the Committees of the Congress, OTA staff cooperate and interact extensively not only with Congressional staff, but also with staffs of other federal agencies, in both the Legislative and Executive branches, as well as with the private sector and universities. This extensive networking not only serves to avoid duplication but also helps to increase Congress' analytical resource base and enables OTA to utilize the most up-to-date information available. As a consequence, a typical OTA assessment, costing $500,000, draws heavily upon the work of others that, taken together, very likely costs tens of millions of dollars (and frequently much more).

OTA and the three other Congressional support agencies have adopted a process to fully utilize each other's expertise. CBO, CRS, and GAO staffs coordinate with, and, in some cases, participate in OTA advisory panel meetings, symposia, and workshops. The four agencies share data on related studies and provide new data as input to each others' projects as appropriate to their areas of expertise. In addition, two or more agencies may collaborate in the preparation of testimony or general assistance for Congressional hearings. For example: (1) GAO conducted a field survey to assist OTA's study of mental health services for children, and OTA and GAO jointly advised the Senate Select Committee on Indian Affairs about the types of undertakings most appropriate for each agency; (2) representatives of CBO, CRS, and GAO served on the advisory panel for OTA's study of federal government information technology, and agency data collected by OTA in the course of that study was provided to GAO, avoiding the necessity of a separate, duplicate request to those agencies; (3) OTA made a significant contribution to GAO testimony and reports on strategic command, control, communications, and intelligence systems; and (4) regular bimonthly meetings are held with sister agency staff working in toxic substances to facilitate discussion of ongoing work, coordination of activities, and prevention of overlapping efforts. When two efforts are closely related, agency staff work together (e.g., GAO requested that the project director of OTA's ongoing study of hazardous materials transportation be present during a briefing for staff of the Subcommittee on Commerce, Transportation, and Tourism, House Committee on Energy and Commerce). (See pages 155-158 for more details on FY 1985 interagency coordination.)

Prospective Payment Assessment Commission

The Commission is an independent advisory Committee mandated under the "Social Security Amendments of 1983" (Public Law 98-21, Section 601) which reforms the Medicare program payment method.

Under the Statute, the OTA Director was charged with selecting the Commission members. The terms of the Commission members run from the date of appointment until 1986, 1987, or 1988. Three members' terms ended in 1985, and two reappointments and one new appointment were made by the Director. OTA is also required to report annually to Congress on the functioning and progress of the Commission. A subcommittee of OTA's Health Program Advisory Committee was selected to assist in this process. The first of these reports, First Report on the Prospective Payment Assessment Commission, was issued in March 1985.

11.3. Role of the Energy, Materials, and International Security Division

The Energy, Materials, and International Security Division comprises three Programs: Energy and Materials; Industry, Technology, and Employment; and International Security and Commerce.

The Energy and Materials Program is responsible for assisting the Congress in understanding the technological possibilities for developing our energy and materials resources and the consequences of these developments for society. In this way, the Program can help the Congress ensure rational resource development such that economic growth is maintained, undesirable side effects are kept to a minimum, and the resource base is sustained for future generations. The Program covers those technologies that concern the extraction, delivery, and use of energy and materials. Although primarily directed at domestic resources, the Program also is concerned with world markets and policies, including imports and exports of energy and materials. The responsibilities of this Program represent a merger between two previous Programs -- Energy and Materials -- undertaken (in 1983) because of diminishing Congressional activity about energy.

The Industry, Technology, and Employment Program examines how technology affects the ability of U.S. industry to contribute to a healthy national economy. Its charter includes consideration of the competitiveness of U.S. industries in international markets, the number and nature of employment opportunities, needs for worker education, training and retraining, and ways to ease adjustment in structural economic transitions. A Program with a specific employment focus is new at OTA (the Program was established in 1983), although most assessments have considered employment impacts, and employment and training issues have been of central importance in several studies. ITE's employment concerns center on the quantity, nature, and quality of jobs, the nature of and changes in job skills, and training and retraining across the work force.

The International Security and Commerce Program deals with national security, international relations generally, and international technology transfers. The Program's work in national security involves determination of what is technologically possible followed by an assessment of the likely impacts of these technological considerations on national security, which includes international stability, diplomacy, alliance relations, and arms control, as well as deterrence and defense. ISC's work in technology transfer combines several perspectives: the national security and foreign policy considerations that lie behind export controls, a concern for the health and competitiveness of U.S. industry in international markets; and a concern for the objective of managing technology transfer in such a way as to contribute to favorable international economic development.

11.4. Accomplishments of the Energy, Materials, and International Security Division

In FY 1985, the Division published 7 full assessments: New Electric Power Technologies: Problems and Prospects for the 1990's; U.S. Natural Gas Availability: Gas Supply Through the Year 2000; Strategic Materials: Technologies to Reduce U.S. Import Vulnerability; Superfund Strategy; Ballistic Missile Defense Technologies; Anti-Satellite Weapons, Countermeasures, and Arms Control; and International Cooperation and Competition in Civilian Space Activities. In addition, the Division produced a technical memorandum on Energy Technology Transfer to China, testified 8 times, and prepared 5 staff papers.

Listed below are several examples of direct legislative use of the Division's work:

Energy and Materials

1. Testimony on future electricity demand, based on Nuclear Power in an Age of Uncertainty, was delivered to the Senate Committee on Energy and Natural Resources and assisted in their oversight of the state of the nation's electric utilities.

2. The OTA study, New Electric Power Technologies: Problems and Prospects for the 1990's, offered a comprehensive look at a range of developing generation and load management technologies and provided Congress with a means to evaluate current R&D programs. The study was the basis for testimony before both the House and Senate about the future of electric utilities.

3. OTA's report, Potential U.S. Natural Gas Availability, is serving as important background for Congressional debates about rescinding the Fuel Use Act's prohibition on the use of natural gas for new, large facilities, proposals to extend common carrier status to natural gas pipelines, and alternative transportation fuels.

4. In U.S. Vulnerability to an Oil Import Curtailment, OTA provided an examination of the technical potential for replacing a large quantity of oil over a five year period in the event of a large extended oil shortfall. The blueprint offered in the study for developing that replacement capability is likely to be the subject of Congressional oversite of DOE activities in the next Congress. Following that strategy could reduce economic losses to the nation as a consequence of such a shortfall by tens of hundreds of billions of dollars over a five year period.

5. OTA's report, Environmental Protection in the Federal Coal Leasing Program, provided a Congressionally mandated review of the potential environmental consequences of changes in federal coal leasing that occurred in 1981 and 1982. The Department of Interior, in a review of the leasing program requested by the Congress, concurred with nine of the ten technical and policy options suggested by OTA, has already begun to implement three, and is studying how to implement the remainder. If fully implemented, these revisions should enhance

the program's effectiveness in ensuring adequate environmental protection without adding to the cost of operating the program.

Industry, Technology, and Employment

6. OTA's two major assessments on hazardous waste (Technologies and Management Strategies for Hazardous Waste Control and Superfund Strategy) have had considerable effect on Congressional activities. OTA has testified at numerous Senate and House hearings. All three major substantive themes of the 1984 RCRA amendments (i.e., expansion of the regulated universe, limits on land disposal and use of alternatives, and promotion of source reduction) were supported by OTA's work. More recently, the Congress' work toward reauthorization of Superfund includes proposals that are directly related to findings and options in the OTA reports; these include, use of a waste-end tax, establishment of a technology demonstration program, increased R&D support, technical assistance grants to communities, and fostering alternatives to land disposal. OTA has also analyzed actions at specific Superfund sites; these analyses have had considerable impact on EPA's implementation of Superfund. OTA's work in this area, therefore, has contributed substantially to national policy aimed at increasing environmental protection while avoiding excessive costs to the private sector.

7. The House Committee on Education and Labor used OTA's analysis of some of the implications of early notification of plant closings or of mass layoffs, derived from the ongoing assessment of Technology and Structural Unemployment: Reemploying Displaced Adults, in deliberations on a bill requiring advance notice. The Chairman of the Senate Committee on Labor and Human Resources used the assessment's analysis of the displaced homemaker population and program performance at a conference on women's issues.

8. The results of OTA's report, Wood Use: U.S. Competitiveness and Technology, were used to brief the Senate Committee on Finance on the impact of Canadian lumber imports to the United States and the ability of the American lumber industry to compete with the Canadians on international markets. The Senate Committee on Appropriations has provided funding for a Center for Excellence in Forestry Research, following the OTA study's finding of a need for several centers around the country to work on improved utilization of wood and wood materials.

9. OTA's assessment, International Competitiveness in Electronics, has provided the basis for testimony dealing with Japanese technology and science, with federal support for technology development (particularly manufacturing technologies), and with the effects of the U.S. tax code on productivity. This report also formed part of the foundation for a staff paper entitled "Development and Diffusion of Commercial Technologies: Should the Federal Government Redefine its Role?"

10. Strategic Materials: Technologies to Reduce U.S. Import Vulnerability has been used by the House Committee on Science and Technology in their consideration of materials R&D policy and in their hearings on the implementation of the National Critical Materials Act of 1984. The Committee has been interested in alternatives to dependence on South Africa for supplies of critical materials, and has been especially interested in OTA's findings on the role of information and data analysis capability as it relates to strategic materials. The report has also been used as background to inform Congressional concern over stockpile proposals. The Chairman of the Senate Committee on Commerce, Science, and Transportation praised the report as a valuable insight into ways to reduce the nation's dependence on strategic materials, saying that the report would be useful to the Committee as it considered the research budgets of the National Aeronautics and Space Administration and the National Bureau of Standards, both of which conduct materials research.

International Security and Commerce

11. Testimony based on OTA's technical memorandum, Energy Technology Transfer to China, helped the House Committee on Energy and Commerce review the Agreement (submitted by the President) between the U.S. and China on transfer of nuclear power technologies. The study was also used by the staff of the Senate Committee on Banking, Housing, and Urban Affairs in supporting a similar review.

12. The Arms Control Panel of the House Committee on Armed Services requested a briefing on OTA's report, Anti-Satellite Weapons, Countermeasures, and Arms Control, to assist them in considering possible Congressional action to limit ASAT testing.

12.3. Role of the Health and Life Sciences Division

The Health and Life Sciences Division comprises 3 programs: Biological Applications; Food and Renewable Resources; and Health.

The Biological Applications Program assesses state-of-the-art technologies arising from the cutting edge of biological science. Its broader responsibility is to help Congress understand complex technologies in biomedical sciences. Early warning is very much a part of the Program's charter, and some studies explore potential future applications of biological technologies. Because many of these new technologies have potential impacts that are of great social and political significance, ethical analysis is often a component of the assessments conducted by the Program.

The scope of the Food and Renewable Resources Program includes all agriculture-related technologies used to provide society with food, fiber and chemicals, and technologies that enhance or jeopardize the ability to sustain in perpetuity the renewable resource bases that make such production possible. Agriculture itself is defined in the broad sense, including all crop and livestock production and forestry. Attention also is given to the impact that technology has had and is likely to have on how the agricultural system is organized, who controls it, and where it is heading. Further, the Program covers renewable resources that presently may not be considered or produced as crops, but that support such production and are fundamental to human needs.

The charter of the Health Program, the analysis of technological applications that affect human health, is reflected in three primary types of efforts: 1) assessments of clinical and general health care technologies and related policy areas; 2) assessments in the area of environmental and occupational health; and 3) collaboration with, and assistance to, other Programs on health-related issues in projects. The relationship of health care technology to financing, organization, and systems issues is a growing area of Program activity due to increased and focused Congressional interest. The Program's responsibilities include mandated reviews of protocols for monitoring of the conduct of studies of Agent Orange and of health effects among military personnel and civilians exposed to atomic bomb tests.

12.4. Accomplishments of the Health and Life Sciences Division

In FY 1985, the Division published 5 full assessments: Technology and Aging in America; Status of Biomedical Research and Related Technology for Tropical Diseases; Preventing Illness and Injury in the Workplace; Blood Policy and Technology; and Federal Policies and the Medical Devices Industry. The Division also prepared 2 special reports, Technology, Public Policy, and the Changing Structure of American Agriculture: A Special Report for the 1985 Farm Bill, and The First Report on the Prospective Payment Assessment Commission. In addition, 3 technical memoranda were published: Africa Tomorrow: Issues in Technology, Agriculture, and U.S. Foreign Aid; Review of the Public Health Service's Response to AIDS; and Procurement and Evaluation of Medical Devices by the Veterans' Administration. A background paper on Human Gene Therapy, 2 workshop proceedings, and 8 case studies were published, and Division staff prepared 10 staff papers and testified 5 times.

Listed below are several examples of direct legislative use of the Division's work:

Biological Applications

1. The final draft of the OTA report, Technology and Aging in America, was instrumental in the development of hearings conducted by the Senate Special Committee on Aging on April 15, 1985, that reviewed the relationship of technology to better health for older women. The findings of the report were also the basis of a request from the House Select Committee on Aging for information on the possible differential impacts of environmental pollution on the elderly. The information in the OTA staff paper was used in developing a proposed directive to the Environmental Protection Agency to fund a study on environmental pollution and the elderly. The directive was to be inserted in conference language in an HUD appropriations bill (H.R. 3038). OTA provided information on nutrition and the elderly to the House Committee on Agriculture for the Committee's review of the food stamp and elderly congregate meals programs. The report will also be useful in consideration of several bills currently before the House and Senate (H.R. 167; H.R. 215 and H.R. 1173; H.R. 1168; H.R. 1192; H.R. 2523 and H.R. 2902; H.R. 2951; S. 77, S. 788, S. 873, S. 1378: community based long term care services. H.R. 66; H.R. 524 and H.R. 2280; H.R. 3523; S. 174; S. 751; S. 753; S. 779: research, services, and tax incentives for care of victims of dementing illnesses. H.R. 16; H.R. 1403: new health care financing mechanisms. H.R. 2042; H.R. 3038: housing and residential care programs. H.R. 2368: preventive health services. H.R. 2409; H.R. 2410; S. 1100; S. 1309: research on health and aging.)

An OTA staff paper prepared by staff of the assessments of life-sustaining technologies and dementia examined the dilemma facing America's terminally ill elderly. The paper was included in a forthcoming report, "Dying with Dignity: Difficult Times, Difficult Choices," of the House Select Committee on Aging. According to the Chairman, the OTA document played a major role in ensuring the success of the Committee's hearings.

3. OTA, as part of its ongoing assessment of Disorders Causing Dementia, cooperated with the House Committee on Appropriations in inserting report language for the Task Force on Alzheimer's Disease to develop a report for the Committee on financing of long-term care for patients with dementia. In addition, several sections of the new NIH bill (H.R. 2409) refer to research on dementing conditions, and OTA was consulted by several personal and Committee staff who were involved in writing these sections.

4. Information on risk assessment and risk management developed in the course of the assessment, Reproductive Health Hazards in the Workplace, was used in drafting H.R. 2749, which is designed to coordinate and improve federal activities in risk assessment and risk management.

5. The background paper, Impacts of Neuroscience, stimulated the Subcommittee on Investigations and Oversight, House Committee on Science and Technology, to look into issues related to neurotoxicit Hearings on the topic were held on October 8-9, 1985.

Food and Renewable Resources

6. An OTA technical memorandum, Africa Tomorrow: Issues in Technology, Agriculture, and U.S. Foreign Aid, was used by the Subcommittee on Natural Resources, Agriculture Research, and Environment, House Committee on Science and Technology, for hearings on African food production. The requesters of the study, the House Select Committee on Hunger, cited the timeliness of the study, as it was released just as the Committee considered legislation to assist recovery and rehabilitation in the famine and drought stricken nations of Africa.

7. Testimony, briefings, and the OTA report, Technology, Public Policy, and the Changing Structure of American Agriculture: A Special Report for the 1985 Farm Bill, were used by the Senate Committee on Agriculture, Nutrition, and Forestry and the House Committee on Agriculture to develop agricultural policy in the 1985 Farm Bill. The Chairman of the House Committee on Agriculture commended this report as an important contribution to the assessment of possible changes under consideration in the 1985 Farm Bill.

Health

8. OTA's staff paper, "Replacing the Rosebud Sioux Hospital: Number of Beds and Whether a Surgical Suite is Needed," on the proposed hospital for the Rosebud Sioux Reservation was used by both the House and Senate Committees on Appropriations in deciding on the type and size of hospital justified.

9. OTA staff suggestions, drawn from two OTA reports, Blood Policy and Technology and Medicare's Prospective Payment System, regarding a needed study of the impact of diagnosis related groups on blood banking were used by the House and Senate Committees on Appropriations in mandating such a study to be carried out by the Health Care Financing Administration.

10. Staff of the House Committee on Energy and Commerce used OTA suggestions, drawn from ongoing work on Physician Payment and Medical Technology Under the Medicare Program, in drafting a bill on physician payment reform.

11. OTA's staff paper, Smoking Related Deaths and Financial Costs, was used in markup and related legislative debate concerning the tax on cigarettes.

12. The Senate Committee on Finance used information provided by OTA in deciding whether to cover a new form of home oxygen therapy under the Medicare program.

13. OTA's technical memorandum, Review of the Public Health Service's Response to AIDS, was used as the basis of hearings and continuing oversight of the activities of the Public Health Service in regard to AIDS by the House Committee on Energy and Commerce and the House Committee on Government Operations. Both Committees cited the report as an "invaluable resource document."

14. OTA's technical memorandum, Scientific Validity of Polygraph Testing, was used in Congressional debate over whether the Department of Defense would go ahead with its polygraph screening program.

15. Information from OTA's first annual report on the Prospective Payment Assessment Commission was used in the FY 1986 hearings on appropriations for that agency.

16. Information from OTA's ongoing study of Technology and Indian Health Care helped the House Committee on Interior and Insular Affairs develop hearings on alcoholism among Indians.

17. OTA's evaluation of the scientific value of a study of Vietnam era identical twins was instrumental in the decision not to proceed with that study, which would have cost about $8 million.

18. As part of the ongoing review of the conduct of the Agent Orange studies undertaken by the Centers for Disease Control, OTA has taken a strong stand on the need to develop a scientifically meaningful index of exposure to Agent Orange before the study progresses. Congressional staff are aware of the potential setback that the studies might suffer if this issues is not resolved quickly.

19. OTA's evaluation of the feasibility of the mandated study of health effects among atomic veterans resulted in the conclusion that the study was not feasible as outlined, and this finding is being used in Congressional and Executive Branch debate over whether to proceed with a study.

20. OTA testimony before the House Committee on Science and Technology, Subcommittee on Investigations and Oversight, was used in Congressional debate concerning personal protective devices and exposure to neurotoxins.

13.3. Role of the Science, Information, and Natural Resources Division

The Science, Information, and Natural Resources Division comprises 3 programs: Communication and Information Technologies; Oceans and Environment; and Science, Education, and Transportation.

The Communication and Information Technologies Program is concerned with technologies that create, read, store, manipulate, transmit, or display information. Primarily these are electronic technologies exemplified by computers and communications systems. The core responsibilities of the Program require monitoring the research and development of new information technologies and assessing the technological state of the art in these areas as well as trends in basic research and development. The Program also studies telecommunications regulation, information policy, and applications of information technology in the public sector.

The Oceans and Environment Program has responsibility for all ocean-related questions, including ocean resources and maritime policy, and for large-scale environmental issues, such as climate modification and water pollution. As a result of changing Congressional interest, the Program has developed capability for analyzing the difficult questions in which the overriding concern lies with the environmental effects of decisions. The work of the Program usually falls under one of five basic categories: federal services, natural resource, pollution control, marine industry, and large-scale environmental issues.

The Science, Education, and Transportation Program is responsible for principal work in the broad areas of science policy (basic research direction and resource allocation), education (education in grade K through graduate school and programs for adults not based on job skills), and the more technology specific area of transportation. For purposes of Program development: (1) science includes issues surrounding the health of the scientific enterprise; (2) education refers to in-school and other methods, practices, and philosophy for people from early childhood through adult; and (3) transportation refers to all modes of transport -- vehicular, rail, air, and water.

13.4. Accomplishments of the Science, Information, and Natural Resources Division

In FY 1985, the Science, Information, and Natural Resources Division published 5 full assessments: Information Technology R&D: Critical Trends and Issues; Oil and Gas Technologies for the Arctic and Deepwater; Protecting the Nation's Groundwater from Contamination; Managing the Nation's Commercial High-Level Radioactive Waste; and Civilian Space Stations and the U.S. Future in Space. In addition, the Division also published a technical memorandum on U.S.-Soviet Cooperation in Space, prepared 5 staff papers, and testified 10 times.

Listed below are several examples of direct legislative use of the Division's work:

Communication and Information Technologies

1. Testimony accompanying the release of OTA's report, Electronic Surveillance and Civil Liberties, helped the Subcommittee on Courts, Civil Liberties, and the Administration of Justice, House Committee on the Judiciary, and the Senate Committee on the Judiciary in consideration of H.R. 3378, the Electronic Surveillance Act of 1985. The ongoing study from which this report was derived, Federal Government Information Technology, helped the House Committee on Government Operations in its hearings to consider H.R. 2889, the Computer Security Research and Training Act of 1985, and, in particular, to evaluate National Security and Decision Directive 145 that assigns certain responsibility for the security of civilian government information systems to the National Security Agency.

2. Advice drawn from OTA's study, Information Technology R&D, and an ongoing case study on supercomputers helped the Subcommittee on Research and Development, House Committee on Appropriations, in authorizing and appropriating funds for the National Science Foundation's supercomputer program. The study also helped the House Committee on Science and Technology develop science policy hearings on the impact of the information age on scientific research.

3. Advice based on OTA's ongoing project, Intellectual Property in an Age of Electronics and Information, helped the House Committee on the Judiciary in its consideration of H.R. 2911, the Home Audio Recording Act.

4. OTA's technical memorandum, Review of Postal Automation Strategy: A Technical and Decision Analysis, was cited by the Subcommittee on Government Information, Justice, and Agriculture, House Committee on Government Operations, in conducting an oversight hearing on the U.S. Postal Service's Zip+4 program.

5. OTA's report, Assessment of Alternatives for a National Criminal History System, was cited by a member of the Subcommittee on on Civil and Constitutional Rights, House Committee on the Judiciary, in developing proposals on criminal history record quality.

Oceans and Environment

6. Following publication of the report, Assessment of Maritime Trade and Technology, in 1983, OTA was requested by House and Senate Subcommittees on Merchant Marine to further analyze two topics: R&D and Cargo Policies. A supplementary report on Maritime R&D was used by the Committees to consider H.R. 33, the Maritime Redevelopment Bank Charter Act of 1985. A supplementary report on Alternative Cargo Policies helped in the initiation of H.R. 3662, a bilateral cargo-sharing shipping bill introduced in November 1985.

7. As one part of the current study Wastes in the Marine Environment: Their Management and Disposal, OTA is examining the role of ocean incineration in waste management. Through testimony before a Subcommittee of the House Science and Technology Committee, OTA provided an overview of the central policy and technical issues surrounding this controversial activity. In particular, OTA analyzed the need for ocean incineration, the key areas of public concern regarding its regulation and safety, and its relationship to land-based alternatives for managing hazardous wastes. OTA's effort may play a role in consideration of proposed legislation that calls for a moratorium on ocean incineration pending completion of further research (H.R. 1295 and S. 1039).

8. Managing the Nation's High-Level Radioactive Waste. The Subcommittee on Energy Conservation and Power of the House Committee on Energy and Commerce used this assessment to identify options to be evaluated by the Department of Energy in its forthcoming analysis of the need for a monitored, retrievable storage facility for high-level radioactive waste. In his request that OTA review DOE's study of alternative means of financing and managing the civilian radioactive waste program, the Chairman of the Subcommittee on Energy, Nuclear Proliferation, and Government Processes, Senate Committee on Governmental Affairs, cited OTA's work as a valuable source of objective analysis for the Congress. OTA's work assisted the Committee in its deliberations on the Nuclear Waste Policy Act and in the development of amendments to that Act.

9. According to the Chairman, the House Committee on Merchant Marine and Fisheries benefited substantially from OTA's recent report, Oil and Gas Technologies for the Arctic and Deepwater. The Committee has requested some follow-on work, and the report will also be useful in consideration of several pieces of legislation (Outer Continental Shelf Lands Act, as amended; Federal Water Pollution Control Act of 1972, as amended; Coastal Zone Management Act of 1972, as amended; Marine Mammal Protection Act of 1972; Marine Protection, Research, and Sanctuaries Act of 1972; Endangered Species Act of 1973).

Science, Education, and Transportation

10. Civilian Space Stations and the U.S. Future in Space was delivered to the Congress in time to be a resource for the consideration of NASA authorization and funding for the proposed space station. The Subcommittee on Space Science and Applications of the House Committee

on Science and Technology asked for general testimony on this topic to help them assess the possible options in design and capability of the space station. This report was also used by Members of both the House and Senate to support their request that the President establish a National Commission on Space.

11. A technical memorandum, U.S. Soviet Cooperation in Space, provided analytical material for the Congress as they evaluated whether or not the United States should resume direct cooperative efforts in and regarding space with the Soviet Union. Testimony for the Subcommittee on Space Science and Applications, House Committee on Science and Technology, identified various policy issues that the Congress must confront to determine the choices with highest value to the United States. Staff of this project also provided several direct briefings for Members , and worked closely with House staff to prepare the group of Members who traveled to the Soviet Union this fall to discuss space cooperation. This technical memorandum was used by staff of the Senate Committee on Foreign Relations and the House Committee on Science and Technology, Subcommittee on Space Science and Applications, in considering the implementation of Public Law 95-562. This law supports renewed cooperation in space with the U.S.S.R.

12. An OTA staff paper, Automation and Robotics for the Space Station: Phase B Considerations, was valuable to both House and Senate Appropriations Committees and the Senate Committee on Commerce, Science, and Transportation as they reviewed funding for the space station. Choices that must be made now to ensure improved capability for the station and to assist in the development of automation and robotics were identified by OTA, along with methods of implementation. The Committees used this document to evaluate the recommendations of NASA and the reports prepared by various study groups. This OTA staff paper assisted Committee staff to review the results of NASA studies required by the Congress under Public Law 98-371.

13. Demographic Trends and the Science and Engineering Work Force, a technical memorandum, which will be released in December 1985, provided information used by the Task Force on Science Policy, a special unit of the House Committee on Science and Technology, in organizing their hearings on shortages in scientific manpower. That hearing was a precursor to hearings that will be held in early 1986, following release of the technical memorandum.

14. OTA's report, Airport System Development, was released at a time of mounting congestion and delay at major airports and drew attention to the need to manage traffic more effectively and to make more efficient use of airport capacity. The report will assist the requesting Committee (House Public Works and Transportation) in carrying out its oversight responsibility for the Airport Improvement Program (AIP) and the Airport and Airways Trust Fund, both of which are due for reauthorization in FY 1987. In addition, the Committee is closely following FAA's development of the National Plan for Integrated Airport Systems (NPIAS), mandated in the 1982 AIP bill and

due to be released in December 1985. The Senate Committee on Commerce, Science, and Transportation has collateral interests and will also review the NPIAS and proposals for defederalization of major airports as part of the process of reauthorizing the 1982 Act. The Senate Budget Committee is following the AIP, with particular concern about the status of the Airport and Airways Trust Fund and the ability of major airports to be self-supporting (defederalization).

U.S. House of Representatives
Committee on Science
Hearing On
Scientific and Technical Advice to Congress

Witness:
Congressman Rush Holt

Questions For the Record

Appendix C

Office of Technology Assessment
Justification of Estimates
Submitted to the
Subcommittee on Legislative Branch Appropriations
1988

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OFFICE OF TECHNOLOGY ASSESSMENT

OFFICE OF TECHNOLOGY ASSESSMENT
FISCAL YEAR 1988 BUDGET IN BRIEF
TO THE
SUBCOMMITTEE ON ~~LEGISLATIVE BRANCH APPROPRIATIONS~~

The funds requested represent the best estimate of the Technology Assessment Board of what is required to meet the needs of the 100th Congress.

FY 88 Budget Request:		$19,270,000*
Includes:		
$40,000 for the Prospective Payment Assessment Commission authorized in P.L. 98-21, Section 601		
$25,000 for the Physician Payment Review Commission authorized in P.L. 99-272, Section 9305		
FY 87 Budget Request: $17,700,000		
FY 87 Appropriation:	$15,532,000	
Pay Supplemental for Retirement Costs	545,000	
Pay Supplemental for Pay Costs	209,000	
Program Supplemental for Telephone System	350,000	
Revised FY 87 Appropriation		$16,636,000
ESTIMATED INCREASE IN FY 88 REQUEST OVER FY 87 APPROPRIATION		$2,634,000

Salaries and Expenses

For salaries and expenses necessary to carry out the provisions of the Technology Assessment Act of 1972 (P.L. 92-484), including reception and representation expenses (not to exceed $3,000 from the Trust Fund), and rental of space in the District of Columbia, and those necessary to carry out the duties of the Director of the Office of Technology Assessment under Section 1886 of the Social Security Act as amended by Section 601 of the Social Security Amendments of 1983 (P.L. 98-21), and those necessary to carry out the duties of the Director of the Office of Technology Assessment under Part B of title XVIII of the Social Security Act as amended by Section 9305 of the Consolidated Omnibus Reconciliation Bill of 1985 (P.L. 99-272): [$15,532,000] $19,270,000: Provided, that none of the funds in the Act shall be available for salaries or expenses of any employee of the Office of Technology Assessment in excess of [143] 149 staff employees: Provided further, that no part of this appropriation shall be available for assessments or activities not initiated and approved in accordance with section 3(d) of Public Law 92-484, except that funds shall be available for the assessment required by Public Law 96-151.[: Provided further, that none of the funds in this Act shall be available for salaries or expenses of employees of the Office of Technology Assessment in connection with any reimbursable study for which funds are provided from sources other than appropriations made under this Act, or be available for any other administrative expenses incurred by the Office of Technology Assessment in carrying out such a study, except that funds shall be available for and reimbursement can be accepted for salaries or expenses of the Office of Technology Assessment in conncection with the assessment required by section 101(b) of Public Law 99-190.]

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* FY 1988 amount approved by TAB: $18,200,000; impact of Federal Employees' Retirement System: $1,200,000; savings attributable to new phone system: ($130,000); total amount requested for FY 1988: $19,270,000.

Relation of Work to Legislative Activities

OTA's role is neither to promote nor to discourage development or application of any particular technology but rather to help determine whether or when some form of Federal government participation may make sense. OTA helps identify and clarify options; exposes misleading and incorrect information; and helps raise the level of understanding in the debate about expensive and controversial technical issues.

In each section on divisional accomplishments, we identify some activities during fiscal years 1986 and 1987 to date that illustrate the link between OTA's work and Congressional activity. Please see the following pages for this information:

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- Industry, Technology, and Employment 38
- International Security and Commerce 39

Health and Life Sciences Division
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Science, Information, and Natural Resources Division
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Mandated Activities

Over the past several years, OTA has undertaken several projects as a result of legislative mandates. The first of these projects was our ongoing activity, Monitoring of Mandated Vietnam Veteran Studies (mandated by P.L. 96-151). OTA's work in this area led to additional mandates: P.L. 98-160 requires that OTA monitor certain federal research activities with regard to veterans exposed to atomic radiation; P.L. 99-272 requires that OTA monitor certain federal research activities with regard to women veterans.

There have recently been mandates for full assessments also. In FY 1986, OTA delivered an assessment, Payment for Physician Services, that was mandated by P.L. 98-369. OTA's ongoing assessment of the Strategic Defense Initiative was mandated by P.L. 99-190.

OTA has also been assigned the task of appointing health-related commissions. Most recently, P.L. 99-660 mandated the OTA Director to appoint a citizens' Advisory Panel on Alzheimer's Disease. This mandate does not include any reporting requirements for OTA. However, OTA is required to appoint and monitor the activities of two additional commissions:

Prospective Payment Assessment Commission

The Commission is an independent advisory Committee mandated under the "Social Security Amendments of 1983" (Public Law 98-21, Section 601) that reforms the Medicare program payment method.

Under the Statute, the OTA Director is charged with selecting the Commission members. Initial Commissioners were appointed in 1983, and each year since then the Director has made reappointments or appointed new Commissioners to fill openings created by expiration of terms. Six Commissioners' terms expired in March 1986, and the Director made four reappointments and two new appointments. The Director appointed two new members to ProPAC in August after the Consolidated Omnibus Budget Reconciliation Act of 1985 (P.L. 99-272) increased the number of Commissioners from fifteen to seventeen.

OTA is also required to report to Congress annually on the functioning and progress of the Commission. A panel of outside experts was selected to assist in this process. The second of these reports was issued this past year.

Physician Payment Review Commission

The Physician Payment Review Commission (PhysPRC) is also an independent advisory committee mandated under the Consolidated Omnibus Budget Reconciliation Act of 1985 (P.L. 99-272). PhysPRC's purpose is to advise Congress and the Executive Branch on possible ways of reforming physician payment under the Medicare program.

As with ProPAC, under the statute, the OTA Director is charge with selecting the Commission members. The initial eleven Commissioners were appointed in June 1986 to terms ranging from one to three years. In October 1986, the Director appointed two new members to the Commission in response to the Sixth Omnibus Budget Reconciliation Act (P.L. 99-509), which increased the number of Commissioners from eleven to thirteen. An annual report is also required on PhysPRC.

Interagency Coordination

In carrying out OTA's mission as a shared resource to the Committees of the Congress, its staff cooperate and interact extensively not only with Congressional staff, but also with staffs of other federal agencies, in both the Legislative and Executive branches, as well as with the private sector and universities. This extensive networking not only serves to avoid duplication but also helps to increase Congress' analytical resource base and enables OTA to utilize the most up-to-date information available. As a consequence, a typical OTA assessment, costing $500,000, draws heavily upon the work of others that, taken together, very likely costs tens of millions of dollars (and frequently much more).

It is not uncommon for OTA reports to have a major impact on Executive Branch activities. For instance, the public comments on DOE's draft Transportation Institutional Plan, and DOE's responses to those comments, reflect and address many of OTA's findings about shipments covered by the Nuclear Waste Policy Act, resulting from the assessment of transportation of hazardous materials. Also, Senator Roth sent a copy of OTA's special report, Trade in Services: Exports and Foreign Revenues, directly to Clayton Yeutter, the U.S. Trade Representative. Mr. Yeutter invited OTA to brief the interagency task force on data needs in the service industries, which has been working on this problem for several years. At the meeting, OTA's results and

methodology were discussed in detail, and it was clear that other agencies were beginning to use OTA's report.

OTA and the three other Congressional support agencies have adopted a process to fully utilize each other's expertise. CBO, CRS, and GAO staffs coordinate with, and, in some cases, participate in OTA advisory panel meetings, symposia, and workshops. The four agencies share data on related studies and provide new data as input to each others' projects as appropriate to their areas of expertise. In addition, two or more agencies may collaborate in the preparation of testimony or general assistance for Congressional hearings. For example: (1) CRS is completing and projection of future oil resource reserves and production and analyzing the economics of oil prospects, which will be incorporated in OTA's assessment of possible U.S. energy futures; (2) GAO and OTA cosponsored a workshop on advance notice of plant closings and permanent layoffs, resulting in separate, but complementary, reports; (3) CRS staff has participated in workshops and reviewed papers for OTA's assessment of low-resource agriculture in Africa; (4) OTA, GAO, and CRS all received requests to analyze the Indian health care system, and early, careful coordination enabled each agency to provide Congress with a helpful, non-duplicative, document; (5) GAO is conducting a survey of Federal information needs to serve as an input to the OTA study of Federal information dissemination, and both GAO and CRS have representatives on the advisory panel for the study; (6) in the process of developing OTA's report on ocean incineration, OTA provided CBO with useful technical information from one of OTA's contracts, and CBO supplied OTA with some raw data that was later used in OTA's report; (7) a CRS staff member is serving as a full member of OTA's project staff on the assessment of developing seabed resources in the EEZ. (See pages 157-158 for more details on FY 1986 interagency coordination.)

6. Changes in OTA's Prior Plans for FY 1986 and FY 1987

During Fiscal Year 1986, OTA essentially accomplished its plans, with approved modifications and additions to meet the changing needs of Congress, and also to reflect the inherent uncertainty of research and the attendant need to make adjustments.

The chart below shows the variations in actual obligations for the OTA divisions for FY 1986 from the planned obligations for FY 1986 provided on Schedule A in the FY 1987 budget justification. The chart on page 13 provides a summary by object class of projections and actual expenditures for FY 1986 and is followed by an explanation of variations of more than 10% or $100,000.

Changes in OTA's Prior Plans
($000)

	1986 (est.)	1986 actual	% change
Division A	3,584.0	3,522.0	(1.73)
Division B	3,644.0	3,621.0	(0.63)
Division C	3,644.0	3,496.0	(4.06)
Division G	3,770.0	3,958.0	4.99

11.3. Role of the Energy, Materials, and International Security Division

The Energy, Materials, and International Security Division comprises three Programs: Energy and Materials; Industry, Technology, and Employment; and International Security and Commerce.

The Energy and Materials Program is responsible for assisting the Congress in understanding the technological possibilities for developing our energy and materials resources and the consequences of these developments for society. In this way, the Program can help the Congress ensure rational resource development such that economic growth is maintained, undesirable side effects are kept to a minimum, and the resource base is sustained for future generations. The Program covers those technologies that concern the extraction, delivery, and use of energy and materials. Although primarily directed at domestic resources, the Program also is concerned with world markets and policies, including imports and exports of energy and materials. The responsibilities of this Program represent a merger between two previous Programs -- Energy and Materials -- undertaken (in 1983) because of diminishing Congressional activity about energy.

The Industry, Technology, and Employment Program examines how technology affects the ability of U.S. industry to contribute to a healthy national economy. Its responsibilities include consideration of the competitiveness of U.S. industries in international markets, the number and nature of employment opportunities, needs for worker education, training and retraining, and ways to ease adjustment in structural economic transitions. A Program with a specific employment focus is new at OTA (the Program was established in 1983), although most assessments have considered employment impacts, and employment and training issues have been of central importance in several studies. ITE's employment concerns center on the quantity, nature, and quality of jobs, the nature of and changes in job skills, and training and retraining across the work force.

The International Security and Commerce Program deals with national security, international relations generally, and international technology transfers. The Program's work in national security involves determination of what is technologically possible followed by an assessment of the likely impacts of these technological considerations on national security, which includes international stability, diplomacy, alliance relations, and arms control, as well as deterrence and defense. ISC's work in technology transfer combines several perspectives: the national security and foreign policy considerations that lie behind export controls, a concern for the health and competitiveness of U.S. industry in international markets; and a concern for the objective of managing technology transfer in such a way as to contribute to favorable international economic development.

11.4. Accomplishments of the Energy, Materials, and International Security Division

In FY 1986, the Energy, Materials, and International Security Division published 4 full assessments:

- o Technology and Structural Unemployment: Reemploying Displaced Adults
- o Western Surface Mine Permitting and Reclamation
- o Technologies for Prehistoric and Historic Preservation
- o Serious Reduction of Hazardous Waste.

The Division also produced an interim report, 5 special reports, a technical memorandum, and a background paper:

- o Displaced Homemakers: Programs and Policy (Interim Report)
- o Potential Effects of Section 3 of the Federal Coal Leasing Amendments Act of 1976 (Special Report)
- o Technology for NATO's Follow-on Forces Attack Concept (Special Report)
- o Trade in Services: Exports and Foreign Revenues (Special Report)
- o Plant Closings: Advance Notice and Rapid Response (Special Report)
- o Technology, Trade, and the U.S. Residential Construction Industry (Special Report)
- o Future Opportunities for Advanced Materials (Technical Memorandum)
- o Space Stations and the Law: Selected Legal Issues (Background Paper)

In addition, the Division testified 8 times and prepared 12 staff papers.

Listed below are several examples of direct legislative use of the Division's work:

Energy and Materials

1. In New Electric Power Technologies: Problems and Prospects for the 1990's, OTA evaluated a wide range of developing generation and load management technologies and provided Congress with a means to evaluate current R&D programs. The study has been used widely by the House Committees on Energy and Commerce, and Science and Technology, in the evaluation of clean coal technologies and review of the DOE budget. The study was also used as a basis for testimony on the commercialization of fuel cell technologies before the Senate Committee on Energy and Natural Resources.

2. The technical memorandum, New Structural Materials Technologies: Opportunities for the Use of Advanced Ceramics and Composites, offered a comprehensive look at the range of opportunities for new structural materials and defined a set of research and development priorities over the next 25 years. The study was the basis for testimony before the House Committee on Science and Technology, which oversees the Critical Materials Act of 1984. Ongoing work was also used in testimony before the House Committee on the Judiciary on technical questions regarding plastic firearms.

3. OTA's special report, Potential Effects of Section 3 of the Federal Coal Leasing Amendments Act of 1976, was used extensively by the House

Committee on Interior and Insular Affairs and the Senate Committee on Energy and Natural Resources as they formulated legislative proposals for revising the Section 3 coal leasing amendments.

4. The report, Western Surface Mine Permitting and Reclamation, provided the House Committee on Interior and Insular Affairs with a detailed analysis of the ability of current mining and reclamation technologies, and of federal programs and policies, to meet the statutory mandates for environmental protection in reclaiming the surface of Western coal mined lands.

5. The findings of the OTA report, Technologies for Prehistoric and Historic Preservation, have been an integral part of a major review conducted by the Subcommittee on Public Lands of the House Committee on Interior and Insular Affairs on how federal agencies implement federal preservation policy. OTA has already received requests for follow-on work in this area.

Industry, Technology, and Employment

6. OTA's report, Strategic Materials: Technologies to Reduce U.S. Import Vulnerability, released in January 1985, continues to be of considerable interest to the Congress and others. OTA testified on its findings at hearings on South Africa and critical materials held by the Subcommittee on Transportation, Aviation, and Materials, House Committee on Science and Technology. The specific recommendations of the report also received attention in the FY 1987 appropriations. In its budget justification document for FY 1987, the Department of the Interior proposed new work on recycling of superalloy scrap, noting that the OTA report discussed superalloy recycling as an important technical alternative to dependence on foreign supply.

7. A number of the concepts and themes in OTA's 1985 report, Superfund Strategy, have been embodied in the reauthorized Superfund law. For example, the emphasis on permanently effective remedial cleanup technologies, and the use of Superfund monies for education, training, technical assistance to communities, R&D, and innovative cleanup technology demonstration were influenced by the OTA report and by OTA staff participation in hearings and informal meetings.

8. A number of members have asked OTA to help them review ongoing Superfund cleanup efforts. OTA has, or is in the process of, responding to requests on the Rocky Mountain Arsenal site in Colorado, the Stringfellow site in California, the cleanup of PCB's in Indiana, the Lipari Landfill in New Jersey, and a cleanup of a harbor in Indiana. The site reviews assist the Congress in its oversight of a technically complex and expensive program, and also provide insights into major Superfund policy issues. With the substantial increase in Superfund spending, it is likely that several Committees will call upon OTA to provide assistance for an intensive period of Congressional oversight on the technical, environmental, and economic effectiveness of the Superfund program.

9. The Chairman of the Senate Committee on Labor and Human Resources used information from the assessment, Technology and Structural Unemployment and its interim report, Displaced Homemakers: Programs and Policy, in a report accompanying P.L. 99-496, Amendments to the Job Training Partnership Act. The report cited OTA's figures on the numbers of displaced homemakers and the handicaps many of them face in the job market as support for authorization of research, demonstration, and pilot projects to increase training opportunities for displaced homemakers.

10. The assessment, Technology and Structural Unemployment: Reemploying Displaced Adults, and a follow-on study, Plant Closing: Advance Notice and Rapid Response, were part of the reason for the restoration of funding of the Job Training Partnership Act, Title III. Title III funds were cut from $220 million in Program Year (PY) 1984 to $100 million in PY 1985, and then increased to $200 million for PY 1986. Both studies pointed out that many States were unable to respond rapidly and effectively to serve more than a few percent of displaced workers with existing funds, and with cuts in funding would probably serve even fewer people.

11. Information and technical conclusions from the assessment, Technology and Structural Unemployment: Reemploying Displaced Adults, have been used in several pieces of proposed legislation, notably S. 2374, which was introduced by Senator Heinz and focused on remedial education for displaced workers and ways to improve vocational training, and H.R. 4728, the Education and Training for American Competitiveness Act, which was introduced by the Chairman of the House Committee on Education and Labor. The report accompanying the latter bill stressed the importance of literacy and basic skills, a point made strongly in the OTA report, and cited OTA's findings on how displaced workers without basic skills fare in the job market.

International Security and Commerce

12. Unclassified testimony and OTA's classified special report, Technologies for NATO's Follow-on Forces Attack Concept, were a major input to the efforts of the Subcommittee on Research and Development, House Committee on Armed Services, to devise a "conventional defense initiative."

13. OTA testified before the Subcommittee on Research and Development, House Committee on Armed Services, on the findings of the report, Ballistic Missile Defense Technologies.

14. Based on completed and ongoing work, OTA provided informal assistance, and testimony for the record, to the House Committee on Foreign Affairs on the technical implications of certain disputed provisions of the 1972 ABM Treaty.

15. OTA assisted the Subcommittee on Space Applications, House Committee on Science and Technology, in formulating alternative policy options for commercial space launches.

16. The Subcommittee on Space Applications, House Committee on Science and Technology, used OTA's background paper, Space Stations and the Law: Selected Legal Issues, as a basis for requesting reports from NASA on legal aspects of space station planning.

11.5. Changes in Prior Plans for FY 1986 and FY 1987 for the Energy, Materials, and International Security Division

During Fiscal Year 1986, the Energy, Materials, and International Security Division essentially accomplished its plans, with approved modifications and additions to meet the changing needs of Congress, and also to reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

Budget curtailments during FY 1986 affected the scope and detail of some assessments of the Energy and Materials Program, scheduled for completion in FY 1987. The new assessments were smaller in scale and less detailed, in addition to being built upon past assessments, and the Program is concentrating on delivering more specialized follow-up staff memoranda when major assessments are delivered.

(Please see the chart on page 12 for the breakdown of the differences in estimated and actual Division spending for FY 1986.)

11.6. Priorities During FY 1988 for the Energy, Materials, and International Security Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Energy, Materials, and International Security Division may be asked to undertake in Fiscal Years 1987 and 1988. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Energy and Materials

- Future Directions in the Use of Metals

This assessment would examine the technical opportunities for advanced metal alloys and fabrication processes that could make a significant change in the way metals are used in the economy. In particular, it would look at ways to improve strength per unit weight, reduce processing time and costs, and increase corrosion resistance, thus expanding applications of metals and lowering costs.

12.3. Role of the Health and Life Sciences Division

The Health and Life Sciences Division comprises 3 programs: Biological Applications; Food and Renewable Resources; and Health.

The Biological Applications Program assesses state-of-the-art technologies arising from the cutting edge of biological science. Its broader responsibility is to help Congress understand complex technologies in biomedical sciences. Early warning is very much a part of the Program's charter, and some studies explore potential future applications of biological technologies. Because many of these new technologies have potential impacts that are of great social and political significance, ethical analysis is often a component of the assessments conducted by the Program.

The scope of the Food and Renewable Resources Program includes all agriculture-related technologies used to provide society with food, fiber, and chemicals, and technologies that enhance or jeopardize the ability to sustain in perpetuity the renewable resource bases that make such production possible. Agriculture itself is defined in the broad sense, including all crop and livestock production and forestry. Attention also is given to the impact that technology has had and is likely to have on how the agricultural system is organized, who controls it, and where it is heading. Further, the Program covers renewable resources that presently may not be considered or produced as crops, but that support such production and are fundamental to human needs.

The charter of the Health Program, the analysis of technological applications that affect human health, is reflected in three primary types of efforts: 1) assessments of clinical and general health care technologies and related policy areas; 2) assessments in the area of environmental and occupational health; and 3) collaboration with, and assistance to, other Programs on health-related issues in projects. The relationship of health care technology to financing, organization, and systems issues is a growing area of Program activity due to increased and focused Congressional interest. The Program's responsibilities include mandated reviews of protocols for monitoring of the conduct of studies of Agent Orange and of health effects among military personnel and civilians exposed to atomic bomb tests.

12.4. Accomplishments of the Health and Life Sciences Division

In FY 1986, the Health and Life Sciences Division published 7 full assessments:

- Medicare's Prospective Payment System: Strategies for Evaluating Cost, Quality, and Medical Technology
- Reproductive Health Hazards in the Workplace
- Payment for Physician Services: Strategies for Medicare
- Alternatives to Animal Use in Testing, Research, and Education
- Technology, Public Policy, and the Changing Structure of American Agriculture
- Technology and Indian Health Care: Effectiveness, Access, and Efficiency
- Technology for Detecting Heritable Mutations.

The Division also prepared 1 special report and 4 background papers:

- Continuing the Commitment: Agricultural Development in the Sahel (Special Report)
- Assessing Biological Diversity in the United States: Data Considerations (Background Paper)
- Grassroots Conservation of Biological Diversity in the United States (Background Paper)
- Hearing Impairment and Elderly People (Background Paper)
- Case Study #36: Effects of Federal Policies on Extracorporeal Shock Wave Lithotripsy (Background Paper)

In addition, the Division produced 13 staff papers and testified 10 times.

Listed below are several examples of direct legislative use of the Division's work:

Biological Applications

1. Publication of the OTA report, Alternatives to Animal Use in Research, Testing, and Education, was followed by hearings on that subject, with OTA's testimony as the lead, before the Subcommittee on Science, Research, and Technology, House Committee on Science and Technology. In addition, one of the several options for congressional action illustrated in the report was adopted by the Senate Committee on Appropriations in its appropriation for the Environmental Protection Agency for FY 1987. The report accompanying the appropriations bill directs the EPA to provide a summary of each research activity that is related to the evaluation of whole-animal testing, and substitutes for whole-animal use and related research. Throughout FY 1986, OTA provided support for congressional staff on issues involving animals, such as the branding of dairy cows by the U.S. Department of Agriculture.

2. As part of its ongoing assessment of Infertility Prevention and Treatment, OTA worked closely with the staff of the Committees on Veterans' Affairs in both the House and Senate in identifying the needs of veterans relative to procreation. The Senate passed the Omnibus Veterans' Benefits Improvement and Health Care Authorization Act of 1986, which included direction to the Veterans Administration to provide services (for a three-year trial period) to help a veteran or veteran's spouse achieve pregnancy. The House bill did not contain such a measure. The provision was dropped in conference. Staff of both Committees have expressed strong interest in OTA's ongoing assessment.

3. Information on the environmental application of genetically engineered organisms, derived from OTA's ongoing assessment of New Developments in Biotechnology, was presented at a conference in which 5 members of Congress participated. OTA staff suggestions have been solicited in support of hearings on biotechnology held by the Subcommittee on Investigations and Oversight of the House Committee on Science and Technology as well as the Subcommittee on Investigations and Oversight of the House Committee on Energy and Commerce throughout FY 1986. In addition, OTA staff and staff of the General Accounting Office met on several occasions in FY 1986 to coordinate reports being prepared by each agency.

4. There were 38 bills in the 99th Congress on Alzheimer's disease, and more than a dozen other bills on related topics such as long term care. As a result of expertise developed during its assessment of Disorders Causing Dementia (in press) OTA was invited to comment on the majority of these. In July 1986, OTA testified before the Subcommittee on Aging, Senate Committee on labor and Human Resources, on Federal support for research on dementia. The high degree of Congressional interest in dementia is shown by the fact that OTA staff has been in contact with 129 staff on 16 committees and 76 personal offices on this subject. About 50 Congressional staff attended one or more panel meetings, workshops, or briefings held in connection with the assessment. With the Congressional Clearinghouse on the Future, OTA organized a Congressional symposium on Alzheimer's disease.

Food and Renewable Resources

5. The technical memorandum, Africa Tomorrow: Issues in Technology, Agriculture, and U.S. Foreign Aid, was used by the Subcommittee on Natural Resources, Agriculture Research, and Environment, House Committee on Science and Technology, to select topics for four days of hearings on development in Africa. OTA staff also suggested witnesses for these hearings. Material from this study was also used in: 1) a bill on environmental training and management (H.R. 4908); a bill on African famine prevention (H.R. 2782 and S. 1364); and a bill on reforming aid to Africa (H.R. 4865 and S. 2208).

6. As part of OTA's ongoing work on low-resource agriculture development for Africa, OTA staff has: 1) briefed the Subcommittee on Africa, Senate Committee on Foreign Relations, in preparation for four days of hearings on management issues within the Agency for International Development; 2) helped the House Select Committee on Hunger prepare for satellite-transmitted hearings on development in Africa; 3) provided an evaluation of AID's Sahel Development Program that is being used in Congressional and Executive Branch debate over continuation of the program, its special legislative status, and its Congressional reporting requirements; 4) provided briefing papers and answered technical questions for the delegation sent to London, Rome, and Israel by the Subcommittee on Natural Resources, Agriculture Research, and Environment, House Committee on Science and Technology; and 5) suggested witnesses for hearings on multilateral development banks' environmental policies held by the Subcommittee on International Development Institutions, House Committee on Banking, Finance, and Urban Affairs.

7. The OTA report, Technology, Public Policy, and the Changing Structure of American Agriculture, was used by both the Senate and House Committees on Agriculture on bills introduced on dairy, feedgrains, credit, and research and extension issues. The report was also used by the Democratic Steering Policy Committee to draft a policy statement on agriculture. OTA testified before the House Committee on Agriculture on bills introduced to improve grain quality.

8. OTA testified on renewable resources and economic development in Puerto Rico before the House Committee on Interior and Insular Affairs as part

of the ongoing study of Integrated Renewable Resource Management for U.S. Insular Areas.

9. As part of OTA's ongoing assessment of Technologies to Maintain Biological Diversity, OTA staff provided information through testimony and a staff paper, "The Role of U.S. Development Assistance in Maintaining Biological Diversity in Developing Countries," to the Senate Committee on Foreign Relations in its deliberation and markup of H.R. 2958. This study also provided information on agricultural germplasm that was used in drafting H.R. 3973, which addresses the need to improve U.S. capacity to conserve plant and animal genetic resources. Background papers to this report were used by members considering threats to minor livestock breeds in the U.S. and in the debate over whether the establishment of a national biological survey is feasible.

Health

10. OTA continues to review vaccine literature and vaccine compensation issues for Congress. In FY 1986, OTA testified before the Subcommittee on Health and the Environment, House Committee on Energy and Commerce, on the efficacy, safety, and cost-effectiveness of childhood vaccines; the testimony was used in drafting legislation on federal funding of vaccine purchases through the Centers for Disease Control. After discussions with OTA staff, the Senate passed a bill incorporating changes related to adverse effects from childhood vaccines required to enter school; the bill was originally based on a 1980 technical memorandum, Compensation for Vaccine-Related Injuries.

11. Legislation was introduced by members of the Subcommittee on Health, Senate Committee on Finance, that would implement four of the policy options from OTA's assessment, Medicare's Prospective Payment System: Strategies for Evaluating Cost, Quality, and Medical Technology. Two of those options were enacted in the Sixth Omnibus Budget Reconciliation Act (SOBRA).

12. OTA performed a review of the efficacy and safety of devices to conserve oxygen, which was used by the Subcommittee on Health and the Environment, House Committee on Energy and Commerce, in drafting a bill for Medicare Part B.

13. OTA's report, Payment for Physician Services: Strategies for Medicare, and a related background paper on payment for cataract surgery, were used as the basis for hearings held by the House Committee on Ways and Means and by the Senate Committee on Finance. SOBRA included several provisions related to the report's policy options, as did the Consolidated Omnibus Budget Reconciliation Act.

14. At congressional request, OTA held a workshop and produced a staff paper on immunosuppressive drugs for kidney transplants, and SOBRA extends Medicare coverage to immunosuppressive drugs for one year after organ transplants, the first Medicare coverage of ambulatory drugs.

15. OTA's 1982 report, Technology and Handicapped People, included a policy option for Congress to consider establishing a joint public-private

corporation to provide marketing and production-related services for disability technologies to both the private and the public sectors. This policy option was adopted in the Rehabilitation Act Amendments of 1986, which also incorporated some of OTA's findings in regard to designation of rehabilitation engineering as a shortage specialty and research and development.

16. OTA's assessment of Indian Health Care was the basis for testimony before the Subcommittee on Health and the Environment, House Committee on Energy and Commerce, and the Senate Select Committee on Indian Affairs. The report influenced proposed legislation to provide better insurance coverage for Indian Health Service (IHS) physicians to provide for a demonstration health care program for Native Hawaiians. Some actions have been taken directly by the Executive Branch as a result of OTA's report: for instance, better claims processing by IHS and increased attention to recruiting professionals.

17. OTA testified before the Subcommittee on Human Resources, House Committee on Post Office and Civil Service, on the accuracy and reliability of urine drug screening testing in response to several initiatives to test the federal work force for drug use.

18. A draft of the background paper, Nurse Practitioners, Physician Assistants, and Certified Nurse-Midwives, was used by the Subcommittee on Health and the Environment, House Committee on Energy and Commerce, in designing an amendment to the Medicare program, dealing with payment for physician assistants under specific circumstances.

19. OTA reviewed further protocol changes by CDC for its Agent Orange study. OTA did not grant final approval to the design and recommended that the next stage of the study be delayed until acceptable modifications were made. CDC wrote to both the House and the Senate Committees on Veterans' Affairs agreeing to modify their plans.

12.5 Changes in Prior Plans for FY 1986 and FY 1987 for the Health and Life Sciences Division

During Fiscal Year 1986, the Health and Life Sciences Division essentially accomplished its plans, with approved modification and additions to meet the changing needs of Congress, and also to reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

Budget curtailments in FY 1986 caused the Health Program to disband its Program Advisory Committee, and the Program eliminated a small project on Epidemiological Methods for Assessing Environmental Risks in Small Populations.

(Please see the chart on page 12 for the breakdown of the differences in estimated and actual Division spending for FY 1986.)

13.3 Role of the Science, Information, and Natural Resources Division

The Science, Information, and Natural Resources Division comprises 3 programs: Communication and Information Technologies; Oceans and Environment; and Science, Education, and Transportation.

The Communication and Information Technologies Program is concerned with technologies that create, read, store, manipulate, transmit, or display information. Primarily these are electronic technologies exemplified by computers and communications systems. The core responsibilities of the Program require monitoring the research and development of new information technologies and assessing the technological state of the art in these areas as well as trends in basic research and development. The Program also studies telecommunications regulation, information policy, and applications of information technology in the public sector.

The Oceans and Environment Program has responsibility for all ocean-related questions, including ocean resources and maritime policy, and for large-scale environmental issues, such as climate modification and water pollution. As a result of changing Congressional interest, the Program has developed capability for analyzing the difficult questions in which the overriding concern lies with the environmental effects of decisions. The work of the Program usually falls under one of five basic categories: federal services, natural resources, pollution control, marine industry, and large-scale environmental issues.

The Science, Education, and Transportation Program is responsible for principal work in the broad areas of science policy (basic research direction and resource allocation), education (education in grade K through graduate school and programs for adults not based on job skills), and the more technology specific area of transportation. For purposes of Program development: (1) "science" includes issues surrounding the health of the scientific enterprise; (2) "education" refers to in-school and other methods, practices, and philosophy for people from early childhood through adult; and (3) "transportation" refers to all modes of transport - vehicular, rail, air, and water.

13.4 Accomplishments of the Science, Information, and Natural Resources Division

In FY 1986, the Science, Information, and Natural Resources Division published 7 full assessments:

- Electronic Surveillance and Civil Liberties*
- Management Security and Congressional Oversight*
- Electronic Records Systems and Individual Privacy*
- Automation of America's Offices
- Intellectual Property Rights in an Age of Electronics and Information
- Transportation of Hazardous Materials
- Ocean Incineration: Its Role in Managing Hazardous Waste

* Part of the project on Federal Government Information Technologies

The Division also published a special report, 4 technical memoranda, and 2 background papers:

- o Transportation of Hazardous Materials: State and Local Activities (Special Report)
- o Demographic Trends and the Scientific and Engineering Workforce** (Technical Memorandum)
- o The Regulatory Environment for Science** (Technical Memorandum)
- o Research Funding as an Investment: Can We Measure the Returns?** (Technical Memorandum)
- o Marine Applications for Fuel Cell Technologies (Technical Memorandum)
- o Microelectronics Research and Development (Background Paper)
- o Scientific Use of Supercomputers (Background Paper)

In addition, the Division prepared 14 staff papers and testified 12 times.

Listed below are several examples of direct legislative use of the Division's work:

1. The OTA report, Electronic Surveillance and Civil Liberties, was used extensively, by both the House and the Senate, of the Electronic Communications Privacy Act of 1986, which was enacted in the closing days of the 99th Congress. This legislation addressed many of the issues and findings presented in the OTA report, and extended privacy protections for new forms of electronic communications, including digital transmission systems, electronic mail, cellular telephones, and computer data communication.

2. The OTA report, Electronic Record Systems and Individual Privacy, was used during the development of the Computer Matching and Privacy Act of 1986 that was introduced in the Senate and during subsequent hearings at which OTA testified.

3. The Paperwork Reduction Reauthorization Act of 1986 was enacted by Congress as Title VIII of the continuing resolution and was signed into law as P.L. 99-591. Title VIII addresses many of the issues and findings presented in the OTA report, Federal Government Information Technology: Management, Security, and Congressional Oversight, particularly: extending the purposes of the Act to include maximizing the usefulness of information disseminated by the Federal Government and improving the quality of Federal decisionmaking based on such information; including record privacy in the statutory responsibilities of the Director of OMB's Office of Information and Regulatory Affairs; and clarifying Congressional intent that the Federal Information Locator System is to assist agencies and the public in locating existing government information. The Computer Fraud and Abuse Act of 1986 was enacted by Congress and also addressed some of the issues presented in this report.

4. The report, Intellectual Property Rights in an Age of Electronics and Information, was used by the House and Senate Committees on the

**Part of the project on Science Policy

Judiciary in their consideration of several (as many as 67) bills to adjust copyright law or provide other forms of relief in response to problems raised by new technologies.

As part of its ongoing assessment of Wastes in the Marine Environment, OTA examined the role of ocean incineration in waste management. Testimony before a Subcommittee of the House Committee on Merchant Marine and Fisheries played a role in consideration of proposed legislation that called for a moratorium on ocean incineration. The House Committee on Science and Technology used a staff paper produced from the same project, "Subseabed Disposal of High-Level Radioactive Waste," as a basis for some of its FY 1987 budget recommendations for DOE. OTA also prepared a technical memorandum, Marine Application of Fuel Cell Technologies, for the Senate Committee on Commerce, Science, and Transportation, and testified on this subject before the Senate Committee on Energy and Natural Resources. This work was used in consideration of federal R&D programs for new energy technologies.

6. OTA testified before the Subcommittee on Crime, House Committee on the Judiciary, on the results of a staff paper, " Technical Questions Regarding Plastic Firearms," prepared at that Committee's request. This work was used in consideration of legislative proposals to ban the manufacture of plastic weapons.

7. As a result of a workshop held to inform the project, Technologies for Exploring and Developing U.S. Exclusive Economic Zones, on the issue of resolving conflicts in the outer continental shelf oil and gas leasing program, the House Committee on Merchant Marine and Fisheries is reappraising the State and public consultation provisions of the Outer Continental Shelf Lands Act.

8. Using data and computer models developed during the 1984 assessment, Acid Rain and Transported Air Pollutants, OTA continued to assist the House Committee on Energy and Commerce and the Senate Committee on Environment and Public Works in their consideration of acid rain control bills. To assist the House deliberations, five staff papers and testimony were prepared analyzing H.R. 4567, as introduced, and the amendments proposed during subcommittee and full committee markup.

9. Transportation of Hazardous Material: State and Local Activities, an OTA special report, was used in draft form by the Subcommittee on Telecommunications, Consumer Protection, and Finance, House Committee on Energy and Commerce, and the Subcommittee on Government Activities and Transportation, House Committee on Government Operations, in preparing H.R. 4612. OTA testified at hearings on that bill. The Senate Committee on Environment and Public Works used the report in preparing the community right-to-know and community emergency response planning sections of the Superfund bill enacted into law this session. The full report, Transportation of Hazardous Materials, was used extensively by the Senate Committee on Commerce, Science, and Transportation, and the House Committee on Public Works and Transportation, as each worked on separate versions of a bill requiring national guidelines for truck driver licensing. OTA staff assisted in reviewing the bills prior to the conference Committee meeting. The bill was signed into law in late

October. Committees concerned with nuclear waste shipments and State governments also made use of the report. Written comments on the report were requested by the Senate Committee on Commerce, Science, and Transportation preparatory to planning hearings on the Hazardous Materials Transportation Act early in the 100th Congress.

10. Findings of the technical memorandum, The Regulatory Environment for Science, were presented in testimony to the Science Policy Task Force of the House Committee on Science and Technology. Questions of regulation in research have been of considerable concern to Task Force and Committee Members, particularly with regard to the U.S. international competitive position.

11. OTA also produced the technical memorandum, Demographic Trends and the Scientific and Engineering Work Force, for the Science Policy Task Force. OTA findings were delivered in testimony and were helpful to the Committee in judging between possible responses to the coming decline in the college age cohort, and concerns over adequacy of the supply of scientists to support the research base. Work in progress at the National Science Foundation was influenced by the report, and the Chairman of the Committee asked that OTA undertake a more extensive follow-on report for the 100th Congress.

12. Research as an Investment: Can We Measure the Returns?, a third technical memorandum prepared for the Task Force, provided a framework for review of the various options under consideration for improving the "productivity" of the federal investment in research. The OTA report was the focal point for a series of hearings on this topic, and will be used by the Committee in agency oversight as well as during consideration of various authorization requests.

13.5. Changes in Prior Plans for FY 1986 and FY 1987 for the Science, Information, and Natural Resources Division

During Fiscal Year 1986, the Science, Information, and Natural Resources Division essentially accomplished its plans, with approved modification and additions to meet the changing needs of Congress, and also to reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 12 for the breakdown of the differences in estimated and actual Division spending for FY 1986.)

13.6. Priorities During FY 1988 for the Science, Information, and Natural Resources Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety

of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Science, Information, and Natural Resources Division may be asked to undertake in Fiscal Years 1987 and 1988. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Communication and Information Technologies

o Artificial Intelligence

This study would examine the new developments in artificial intelligence that are expected to offer many new tools in a wide range of areas, including government, manufacturing, financial services, education, engineering, and medicine. Areas of prime Congressional concern, including the level of federal R&D support and the balance between basic and developmental research, would be addressed.

o Science, Technology, and the Courts

To an increasing degree, courts are asked to evaluate scientific and technical information in their deliberations. This study would characterize the role technical data play in legal decisions, characterize the problems, and explore options for institutional response.

o Information Technology and the Securities Markets

Computers and communications systems are transforming the securities markets as computerized financial models are being used to create new instruments and new forms of decision-making and trading. This study would assess the impact of new information technologies on the availability of investment capital, their regulatory impact, the changing nature of fraud, and the vulnerability of electronic markets to disruption.

o Information Technology and the Media

Remote sensing satellites, laser-guided cameras, access to computer data bases, and electronic surveillance technologies are changing the way the media collect information. Computers, communications, and printing technologies are changing the way they process, publish, and distribute it. This study will examine the impact these technologies may have on the media, the the concerns - including right to privacy, the first amendment, and national security - raised by increasing application of these technologies by non-governmental sources.

o Information Technology and the Congress

Computers and communication systems offer a range of new tools for Congress to do its work. This study would explore opportunities such as electronic mail and two-way satellite television for constituent communication, access to data bases, and use of models and other computer-based decision aids.

U.S. House of Representatives
Committee on Science
Hearing On
Scientific and Technical Advice to Congress

Witness:
Congressman Rush Holt

Questions For the Record

Appendix D

Office of Technology Assessment
Justification of Estimates
Submitted to the
Subcommittee on Legislative Branch Appropriations
1989

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OFFICE OF TECHNOLOGY ASSESSMENT

Office of Technology Assessment
U.S. Congress

Fiscal Year 1989
Justification of Estimates

Submitted to

Subcommittee on
Legislative Branch Appropriations

December 21, 1987

As an integral part of carrying out assessments, OTA also provides, during the course of a project as well as after its delivery, expert advice, briefings, testimony, and results of OTA assessments to Committees matched to their specific needs and the Congressional agenda. (See pages 138-153.)

The reports represent comprehensive synthesis and analysis on some of the most controversial and costly issues faced by Congress ... covering, for example, hazardous waste reduction and management, international trade and technology transfer, the future of American agriculture, the technology for defensive weapons, health care cost containment, and the future of biotechnology. These studies directly reflect the expressed needs and priorities of Committees of House and Senate. During the year, OTA served over 90 different Committees and Subcommittees of both houses, typically in response to bipartisan requests.

Relation of Work to Legislative Activities

OTA's role is neither to promote nor to discourage the development or the application of any particular technology or legislation but rather to help committees determine whether or when some form of Federal government participation may make sense. OTA helps identify and clarify options; exposes misleading and incorrect information; and helps raise the level of understanding in the debate about expensive and controversial technical issues.

In each section on OTA's divisional accomplishments, we identify some activities during fiscal years 1987 and 1988 to date that illustrate the link between OTA's work and specific Congressional activity. Please see the following pages for this information:

page

Energy, Materials, and International Security Division
- Energy and Materials 30
- Industry, Technology, and Employment 31
- International Security and Commerce 33

Health and Life Sciences Division
- Biological Applications 47
- Food and Renewable Resources 49
- Health 50

Science, Information, and Natural Resources Division
- Communication and Information Technologies 65
- Oceans and Environment 66
- Science, Education, and Transportation..... 67

Mandated Activities

Over the past several years, OTA has undertaken several projects as a result of legislative mandates. Our ongoing activity, Monitoring of Mandated Vietnam Veteran Studies (mandated by P.L. 96-151) was the first piece of "legislated" work. OTA's work in this area led to additional mandates: P.L. 98-160 requires that OTA monitor certain federal research activities with regard to veterans exposed to atomic radiation; P.L. 99-272 requires that OTA monitor certain federal research activities with regard to women veterans.

There have also been recent mandates for full assessments. In FY 1986, OTA delivered an assessment, Payment for Physician Services, mandated by P.L. 98-369. OTA's assessment of the Strategic Defense Initiative was mandated by P.L. 99-190; a classified version of this report was delivered to appropriate committees in September 1987 (an unclassified version is still under classification review).

OTA has also been assigned the task of appointing health-related commissions. Most recently, P.L. 99-660 mandated the OTA Director to appoint a citizens' Advisory Panel on Alzheimer's Disease. This mandate does not include any reporting requirements for OTA. However, OTA is required to appoint and monitor the activities of two additional commissions (see below).

Prospective Payment Assessment Commission (ProPAC)

The Commission is an independent advisory Committee mandated under the "Social Security Amendments of 1983" (Public Law 98-21, Section 601) that reform the Medicare program payment method.

Under the Statute, the OTA Director is charged with selecting the Commission members. Initial Commissioners were appointed in 1983. Six Commissioners' terms expired in March 1987, and the Director made one reappointment and five new appointments. The Director appointed a new member to ProPAC in September 1987 to replace a Commissioner who resigned.

OTA is also required to report to Congress annually on the functioning and progress of the Commission. The third of these reports was issued this past year. A panel of outside experts was selected to assist in this process.

Physician Payment Review Commission (PhysPRC)

The Physician Payment Review Commission is also an independent advisory committee mandated under the Consolidated Omnibus Budget Reconciliation Act of 1985 (P.L. 99-272). PhysPRC's purpose is to advise Congress and the Executive Branch on possible ways of reforming physician payment under the Medicare program.

As with ProPAC, the OTA Director is statutorily charged with selecting the Commission members. Initial appointments to the 13-member Commission were made in 1986, for terms ranging from one to three years. In April of 1987, the Director reappointed the four Commissioners whose terms expired (since the Commission had only been operational for a few months). An annual report is also required on PhysPRC, and the first of these reports was issued in December 1987.

Mandate Avoidance

Demand for OTA assistance is so high that some committees, rather than request studies through the Board (as was contemplated in OTA's enabling legislation), attempt to initiate studies through new legislation. OTA works closely with members of TAB and the Appropriations Committees to maintain the authority of the Board to determine the agenda of the agency and the best use of OTA's limited resources for the whole of Congress. In general, mandates bypass that authority and, therefore, are strongly discouraged as a mechanism

to obtain OTA's help. During the 100th Congress, however, a number of bills have been introduced that would mandate activities for OTA. For example:

S.970	Would require the Director of OTA to appoint one member of a New Products Research Board, which would advise the Secretary of Agriculture on opportunities for research in biotechnology
H.R.2470	Would require the Director of OTA to appoint an 11 member Prescription Drug Payment Review Commission
H.R.2980	Would require OTA to conduct a study of the technical feasibility of and the public safety need for the installation on all trains of automatic control devices
H.R.1700	Would require OTA to review and report biannually on the adequacy of standards and survey procedures of each organization that accredits homecare services provided under Medicare and Medicaid programs
S.1108	Would require the Director OTA to appoint a 13 member National Commission on Long-Term Care and produce an annual report
S.2113	Would require the Director of OTA to appoint a 15 member Rural Health Care Advisory Commission and report annually
H.R.200	Would require the Director of the Office of Technology Assessment to appoint a 9 member Council on Quality Assurance (in health care) and report annually
H.R.737	Directs the Administrator of EPA to contract with OTA for a 3 year study of hazardous waste reduction and management feasibility described in the bill
S.1127	Would require OTA to conduct a study to identify additional or alternative outpatient drugs to be covered under Medicare and make annual recommendations concerning payment limits
H.R.4929	Would require OTA, in consultation with the Secretary of Health and Human Services and the Secretary of Labor, to develop performance standards for a program, the Work Opportunities and Retraining Compact of 1986 (WORC), which links welfare assistance with job training

Members and staff view OTA as uniquely qualified to assist Congress on a variety of issues. OTA works closely with many committees to fulfill their requests for information through accepted channels. Efforts to avoid mandates may become more difficult as OTA's budget becomes tighter and the agency is forced to refuse or curtail a greater number of requests, even when made through proper channels.

Interagency Coordination

In carrying out OTA's mission as a shared resource to the Committees of the Congress, our staff cooperate and interact extensively not only with congressional Members and staff, but also with staffs of other federal agencies, as well as with the private sector and universities. This extensive networking not only serves to avoid duplication but also helps to increase Congress' analytical resource base and enables OTA to utilize the most up-to-date information available. As a consequence, a typical OTA assessment, costing $500,000, draws heavily upon the work of others that, taken together, could cost many times more.

It is not uncommon for OTA reports to have a major impact on Executive Branch activities. For example, we recently received a letter from the USDA, which is required to report on the economic impact of proposed animal welfare rules, praising OTA's report, Alternatives to Animal Use in Research, Testing, and Education, as the first economic analysis of animal use and the one they used as the point of departure in meeting their reporting requirements. When NIH recently convened a task force to review the need for and management of human tissue for research purposes, they used OTA's report, Ownership of Human Tissues and Cells, as one basis for their deliberations on the need to alter or expand the NIH role in acquisition and distribution of human tissue. The Health Care Financing Administration used the research recommendations developed in the OTA report, Losing a Million Minds, to design the research program required by P.L. 99-509. NATO headquarters has requested multiple copies of OTA's report, New Technology for NATO, to be used as briefing materials for staff officers from different countries. OTA's technical memorandum, Technology Dependent Children, was released at the Conference on Alternatives to Hospitalization, and the Department of Health and Human Services' Bureau of Health Care Delivery and Assistance reports that it is receiving considerable postive feedback about the document. The Agency for International Development (AID) used OTA's report, Technologies to Maintain Biological Diversity, to help them move to a rational strategy for dealing with biological diveristy problems in developing countries. Since publication of OTA's study, Integrated Renewable Resource Management for U.S. Insular Areas, the Interior Department has been using the study for its planning and initiatives in U.S. island resource matters. The Federal Aviation Administration noted OTA's report, The Border War on Drugs, as an accurate reflection of the support rendered to law enforcement by the FAA in the areas of air smuggling detection and apprehension, and stated that the report would be useful to FAA as a reference document for future deliberations concerning their support of the law enforcement community. OTA's recent report on fusion, Starpower, is being used by the State Department's Bureau of Oceans and International Environmental and Scientific Affairs in their consideration of the Administration's position on the proper approach to collaboration in fusion research and development.

Over the past several years, OTA and the three other Congressional support agencies have adopted a process to fully utilize each other's expertise. CBO, CRS, and GAO staffs coordinate with, and, in some cases, participate in OTA advisory panel meetings, symposia, and workshops. The four agencies share information on related studies and provide new data as input to each others' projects as appropriate to their areas of expertise. In addition, two or more agencies may collaborate in the preparation of testimony or general assistance for Congressional hearings. Examples from 1987 include: 1) a CRS staff member authored a chapter on marine mineral resources for an OTA assessment; 2) when OTA, CBO, and CRS received identical requests for information on Clean Air Act issues from 29 Members, the agencies' staff met several times to coordinate responses and avoid duplication; 3) two CRS staff papers are being used as background for OTA's assessment of aviation safety; 4) GAO carried out two surveys to meet OTA's needs for a study of federal information dissemination; 5) GAO and OTA met extensively with Hill staff to determine the most appropriate response to a request for information regarding the African Development Foundation; 6) OTA participated in an attempt by the House Committee on Foreign Affairs to identify areas for future sister agency investigation of issues relevant to foreign development

assistance; 7) a CRS staff member wrote a paper for OTA's workshop on Newsgathering from Space; 8) a CRS staffer is working part time on OTA's assessment of Maintaining the Defense Technology Base; 9) OTA contributed a paper to a CRS report prepared for the Joint Economic Committee; 10) GAO and OTA coordinated a major presentation before the National Governors' Association meeting on the Job Training Partnership Act Title III programs; 11) CRS contributed to a projection of future oil resource reserves and to an analysis of the economics of oil prospects for OTA's assessment of energy supply and demand; 12) the sister agencies are meeting regularly to share information on their activities in several areas, such as: (a) AIDS, (b) hazardous waste, (c) trade, and (d) drug interdiction; and 13) OTA has provided information and State contacts for a GAO examination of state health insurance pools, and in return will depend on the GAO activity for more detailed information in this area. (See pages 154-156 for more details on FY 1987 interagency coordination.)

5. Changes in OTA's Prior Plans for FY 1987 and FY 1988

During Fiscal Year 1987, OTA essentially accomplished its goals, with approved modifications, negotiated reductions, and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to make adjustments, and also the fact that the agency must operate with fewer resources. It is important to note that OTA's fixed costs increased substantially, due to renewal of a 10-year lease on its office space, as well as to the increased costs of the Federal Employee Retirement System.

The chart below shows the variations in actual obligations for the OTA divisions for FY 1987 from the planned obligations for FY 1988 provided on Schedule A in the FY 1988 budget justification. The chart on page 15 provides a summary by object class of projections and actual expenditures for FY 1987 and is followed by an explanation of variations of more than 10% or $100,000.

Changes in OTA's Prior Plans
($000)

	1987 (est.)	1987 actual	% change
Division A	4,158.0	3,869.0	(6.95)
Division B	4,158.0	4,070.0	(2.12)
Division C	4,158.0	4,118.0	(0.96)
Division G	4,162.0	4,465.0	7.28

7. OTA's Goals for FY 1989

As Congress utilizes technical information and advice, it must do so "in the full glare of public scrutiny — and with the full participation of the

10.3. Role of the Energy, Materials, and International Security Division

The Energy, Materials, and International Security Division comprises three Programs: Energy and Materials; Industry, Technology, and Employment; and International Security and Commerce.

The Energy and Materials Program is responsible for assisting the Congress in understanding the technological possibilities for developing our energy and materials resources and the consequences of these developments for society. In this way, the Program can help the Congress ensure rational resource development such that economic growth is maintained, undesirable side effects are kept to a minimum, and the resource base is sustained for future generations. The Program covers those technologies that concern the extraction, delivery, and use of energy and materials. Although primarily directed at domestic resources, the Program also is concerned with world markets and policies, including imports and exports of energy and materials.

The Industry, Technology, and Employment Program examines how technology affects the ability of U.S. industry to contribute to a healthy national economy. Its responsibilities include consideration of the competitiveness of U.S. industries in international markets, the number and nature of employment opportunities, needs for worker education, training and retraining, and ways to ease adjustment in structural economic transitions. A Program with a specific employment focus is new at OTA (the Program was established in 1983), although most assessments have considered employment impacts, and employment and training issues have been of central importance in several studies. ITE's employment concerns center on the quantity, nature, and quality of jobs, the nature of and changes in job skills, and training and retraining across the work force.

The International Security and Commerce Program deals with national security, space technology, international relations generally, and international technology transfers. The Program's work in national security involves determination of what is technologically possible followed by an assessment of the likely impacts of these technological considerations on national security, which includes international stability, diplomacy, alliance relations, and arms control, as well as deterrence and defense. The work on space technology involves a range of issues, such as space transportation, international cooperation and competition in civilian space activities, and newsgathering from space, in which technological progress, civilian exploration, commercial uses of space, and national security must be reconciled. ISC's work in technology transfer combines several perspectives: the national security and foreign policy considerations that lie behind export controls, a concern for the health and competitiveness of U.S. industry in international markets; and a concern for the objective of managing technology transfer in such a way as to contribute to favorable international economic development.

10.4. Accomplishments of the Energy, Materials, and International Security Division

In FY 1987, the Energy, Materials, and International Security Division published 3 full assessments:

- New Technology for NATO: Implementing Follow-on Forces Attack

- o International Competition in the Service Industries: Banking, Building, Software, Know-How
- o Technology Transfer to China

The Division also produced 4 special reports, 2 technical memoranda, and 2 background papers:

- o The U.S. Textile and Apparel Industry (Special Report)
- o Trade Adjustment Assistance: New Ideas for an Old Program (Special Report)
- o From Pollution to Prevention: A Progress Report on Waste Reduction (Special Report)
- o U.S. Oil Production - The Effect of Low Prices (Special Report)
- o A Review of U.S. Competitiveness In Agricultural Trade (Technical Memorandum)
- o Commercial Newsgathering From Space (Technical Memorandum)
- o Technologies for the Preservation of Prehistoric & Historic Landscapes
- o Technologies for Underwater Archaeology and Maritime Preservation

In addition, the Division testified 7 times and prepared 8 staff papers.

Listed below are several examples of direct legislative use of the Division's work:

Energy and Materials

1. Publication of OTA's report, Starpower: The U.S. and the International Quest for Fusion Energy, was followed by the first of a series of hearings convened jointly by the Subcommittees on Energy Research and Development and on International Scientific Cooperation of the House Science, Space, and Technology Committee to examine the future of the Department of Energy's Fusion Research and Development Program as well as the plans for international cooperation in fusion research with Japan, Europe, and the Soviet Union. The OTA report was the basis of the Subcommittees' first joint hearing.

2. In the 1985 report, New Electric Power Technologies: Problems and Prospects for the 1990's, OTA evaluated a wide range of developing generation and load management technologies and provided Congress with a means to evaluate current R&D programs. The report is still used widely by energy R&D authorizing committees as a reference source for this area. It, along with the 1987 staff paper, Renewable Energy Technologies: Research and Development Options for Accelerating Commercial Development, formed the basis of OTA's testimony before the Senate Energy and Natural Resources Committee on Commercialization of Solar Power Technologies.

3. OTA's report, Technologies for Prehistoric and Historic Preservation, continues to be an important part of the House Committee on Interior and Insular Affairs' review of how federal agencies implement preservation policy. The report was published in time to be used as background for the Senate and House debates on the Abandoned Shipwrecks Act (H.R. 3558/S. 2569) and for the Senate debate on the Olmsted Heritage Landscapes Act of 1985 (H.R. 37). While neither bill passed both the House and Senate, similar bills were introduced in the 100th Congress.

4. OTA's background paper, Technologies for the Preservation of Historic Landscapes, was requested to give greater attention to the problems inherent in preservation of landscapes, and to support the debate over the Olmsted Heritage Landscapes of 1987 (H.R. 17). The Background Paper was released to the public at the House Interior and Insular Affairs Committee's hearing on the Act and was the basis for OTA's testimony in that hearing.

5. OTA's background paper, Technologies for Underwater Archaeology and Maritime Preservation, was released the day of the Senate Committee on Energy and Natural Resources hearing on the Abandoned Shipwrecks Act of 1987 (S. 858). A similar bill is currently under consideration in the House Committees on Interior and Insular Affairs and on Merchant Marine and Fisheries.

6. OTA's staff paper, Construction and Materials Research and Development for the Nation's Public Works, is being used as background for the Senate Committee on Environment and Public Works' review of opportunities for innovation in the Nation's public works and in authorizing the Federal infrastructure R&D budget. The staff paper was used as the basis for OTA's testimony before the Subcommittee on Water Resources, Transportation and Infrastructure.

7. OTA's special report, U.S. Oil Production: The Effect of Low Oil Prices, was produced as an interim product of the ongoing assessment, Technological Risks and Opportunities for U.S. Energy Supply and Demand. The report is being used as background in a series of hearings on U.S. energy security convened by the House Energy and Commerce Committee's Subcommittee on Energy and Power.

8. Publication of the OTA technical memorandum, New Structural Materials Technologies: Opportunities for the Use of Advanced Ceramics and Composites, was coordinated with hearings on oversight of the National Critical Materials Act of 1984. These hearings were convened by the House Committee on Science, Space and Technology's Subcommittee on Transportation, Aviation and Materials. OTA's report provided an important perspective for the Committee's evaluation of the role of the National Critical Materials Council in coordinating Federal agency materials research and development.

9. OTA's 1986 staff paper, Effects of Replacing Lead with Aromatic Versus Alcohol Octane Enhancers in Gasoline, continues to be requested by staff of various committees and individual members' offices concerned with policy initiatives to develop alcohol fuels, including the House Energy and Commerce Committee and the House Agriculture Committee.

Industry, Technology, and Employment

10. During FY 1987, OTA continued to assist Committees and Members by commenting on cleanup plans at specific Superfund sites, including the Stringfellow site, for Congressman George Brown, and Love Canal, for Congressman LaFalce. Partly as a result of OTA technical review, the EPA Record of Decision calls for destruction of all dioxin contaminated

wastes at Love Canal, and the elimination of the major portion of the proposed containment facility.

11. Technical findings of two OTA studies - Serious Reduction of Hazardous Waste (Report) and From Pollution to Prevention: A Progress Report on Waste Reduction (Special Report) - influenced six waste reduction bills introduced during FY 1987. Important provisions supported by OTA technical findings are: 1) adopting a nonregulatory approach to induce industry to reduce waste generation; 2) creating a technical assistance program to advise industry on how to reduce waste generation; 3) setting up a grants program to the States to help them help industry reduce waste; 4) reorganizing EPA to include an Office of Waste Reduction. In addition, extensive discussions of OTA's technical findings with the House Committee on Science, Space, and Technology and the House Committee on Appropriations led to increased authorization and appropriation for waste reduction within EPA in FY 1988.

    OTA also assisted Mr. Fazio, Chairman of the Subcommittee on Legislative, House Committee on Appropriations, by analyzing the Defense Logistic Agency's waste minimization plan. The outcome was that the DLA's plan was sent back so that it could incorporate consideration of waste reduction at the source.

12. The findings of OTA's report, Plant Closings: Advance Notice and Rapid Response, and a staff paper on the costs and benefits of advance notice of plant closings and rapid help to affected workers (rapid response) were communicated in informal committee briefings and were widely cited by Members who introduced plant closing and/or rapid response legislation in the first session of the 100th Congress. The Brock Commission was also influenced by OTA's work, which was the first to show unequivocally that: 1) effective advance notice necessarily includes rapid response; and 2) most state efforts to implement the Job Training Partnership Act (JTPA) fail to provide rapid response to workers affected by plant closings or mass layoffs.

    Congress continues to make use of the OTA report, Technology and Structural Unemployment. For example, the House-passed Trade Bill drew upon OTA's findings about training - particularly basic skills training - in displaced worker programs to identify unmet needs.

13. The Senate version of the Omnibus Trade Bill reflects OTA's findings on the need for simpler, faster, more certain certification of worker eligibility for trade assistance programs, on coordination of services to displaced workers from the two major relevant programs (TAA and JTPA), and on the importance of combining funding sources (e.g., JTPA, Trade Adjustment Assistance, State funds, private funds). OTA's special report on Trade Adjustment Assistance: New Ideas for an Old Program also found that funds were being withheld from the TAA program to assist firms, which led to initiation of a GAO investigation and subsequent release of the funds.

14. Results of OTA's special report, Trade in Services: Exports and Foreign Revenues, have been presented to the requesting committees and to the Interagency Task Force on Services Trade Data. The report highlighted

the problem of inadequate and faulty services data, a point which Senator Roth brought up with the Office of the United States Trade Representative, leading to OMB approval of the Department of Commerce's BE-20 survey in revised form - one of OTA's high-priority policy options.

15. The Senate Committee on Labor and Human Resources sought OTA's advice on methods to open JTPA Title III to displaced homemakers. They are considering OTA's suggestion to cover dislocated - divorced, widowed, husband disabled - homemakers under Title III while limiting Title II coverage to disadvantaged homemakers.

16. OTA testified before the Technology Policy Task Force of the House Committee on Science, Space, and Technology on the complementary role of services and manufacturing in the economy and on the effect of technology transfers on U.S. competitiveness. OTA has also assisted with preparation of hearing agendas and witness lists.

17. Several OTA staff papers have discussed how responsibility for science and technology development and education and training might be included in the charter for the Council on Industrial Competitiveness, included in the Omnibus Trade Bill. OTA has also commented on how the Omnibus Trade Bill might deal with services data. OTA findings from the report, International Competition in Services, contributed to the Senate bill calling for a White House Conference on International Trade in Services.

International Security and Commerce

18. The House Committee on Foreign Affairs, Subcommittee on International Economic Policy and Trade, held hearings entirely devoted to OTA's report, Technology Transfer to China. OTA was asked to compare policy options identified in the report with provisions of the Omnibus Trade Bill, and to discuss how U.S. experience with technology exports to China might be used to mold portions of the Bill. The House Committee on Energy and Commerce also held hearings on this report.

19. OTA delivered its report, New Technology for NATO, to the House Committee on Foreign Affairs at a joint hearing of its subcommittees on Europe and the Middle East and on Arms Control, International Security, and Science. General Rogers, retired Supreme Allied Commander in Europe and author of the principal NATO initiative for developing these new technologies, testified about his reactions to the report and demonstrated to the committees how the OTA report shed light on many of the most controversial issues now facing the Alliance.

20. Both the House and Senate Committees on Appropriations and on Armed Services used the classified version of OTA's report, SDI Technology, to prepare for conference on the FY 1988 Defense Budget. (The unclassified version was unavailable due to DOD failure to complete classification review).

21. OTA followed up its report, U.S.-Soviet Cooperation in Space, with briefings of staff and Members on U.S.-Soviet cooperation and with assistance in establishing a series of congressional "Spacebridges" with the U.S.S.R. OTA critiqued meetings between Members on the U.S. Steering

Committee and the Soviet delegates, assisted House staff in understanding and responding to Soviet initiatives, and provided briefings to Members participating in the "Spacebridges" on: opportunities and pitfalls, Soviet views, questions to anticipate, and shaping "Spacebridges"/ managing discussions with Soviets more effectively.

10.5. Changes in Prior Plans for FY 1987 and FY 1988 for the Energy, Materials, and International Security Division

During Fiscal Year 1987, the Energy, Materials, and International Security Division essentially accomplished its goals, with approved modifications and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 14 for the breakdown of the differences in estimated and actual Division spending for FY 1987.)

10.6. Priorities During FY 1989 for the Energy, Materials, and International Security Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Energy, Materials, and International Security Division may be asked to undertake in Fiscal Years 1988 and 1989. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Energy and Materials

o INFRASTRUCTURE: WATER AND WASTEWATER SYSTEMS

The inadequacy of water and sewer systems and waste treatment facilities in the United States has received considerable national attention in recent years. New materials and construction methods show great promise for improving durability and performance of such systems. Yet, despite recent advances in construction technologies and materials, repairs that are made frequently do not incorporate these advances, relying instead on the more traditional construction technologies and materials that previously have shown a high deterioration rate. This raises budget and public safety issues for the Congress. This study would focus on the current condition of the U.S. water and wastewater systems infrastructure and examine the materials and construction technologies existing and under development for maintenance, repair, and rehabilitation.

11.3. Role of the Health and Life Sciences Division

The Health and Life Sciences Division comprises 3 programs: Biological Applications; Food and Renewable Resources; and Health.

The Biological Applications Program assesses state-of-the-art technologies arising from the cutting edge of biological science. Its broader responsibility is to help Congress understand complex technologies in biomedical sciences. Early warning is very much a part of the Program's charter, and some studies explore potential future applications of biological technologies. Because many of these new technologies have potential impacts that are of great social and political significance, ethical analysis is often a component of the assessments conducted by the Program.

The scope of the Food and Renewable Resources Program includes all agriculture-related technologies used to provide society with food, fiber, and chemicals, and technologies that enhance or jeopardize the ability to sustain in perpetuity the renewable resource bases that make such production possible. Agriculture itself is defined in the broad sense, including all crop and livestock production and forestry. Attention also is given to the impact that technology has had and is likely to have on how the agricultural system is organized, who controls it, and where it is heading. Further, the Program covers renewable resources that presently may not be considered or produced as crops, but that support such production and are fundamental to human needs.

The charter of the Health Program, the analysis of technological applications that affect human health, is reflected in three primary types of efforts: 1) assessments of clinical and general health care technologies and related policy areas; 2) assessments in the area of environmental and occupational health; and 3) collaboration with, and assistance to, other Programs on health-related issues in projects. The relationship of health care technology to financing, organization, and systems issues is a growing area of Program activity due to increased and focused Congressional interest. The Program's responsibilities include mandated reviews of protocols for monitoring of the conduct of studies of Agent Orange and of health effects among military personnel and civilians exposed to atomic bomb tests.

11.4. Accomplishments of the Health and Life Sciences Division

In FY 1987, the Health and Life Sciences Division published 4 full assessments:

- Integrated Renewable Resources Management for U.S. Insular Areas
- Technologies to Maintain Biological Diversity
- Losing a Million Minds: Confronting the Tragedy of Alzheimer's Disease and other Dementias
- Life-Sustaining Technologies and the Elderly

The Division also prepared 1 special report, 1 technical memorandum, and 3 background papers:

- o New Developments in Biotechnology: Ownership of Human Tissues and Cells (Special Report)
- o Technology-Dependent Children: Hospital v. Home Care (Technical Memorandum)
- o Health Case Study #37: Nurse Practitioners, Physician Assistants, and Certified Nurse-Midwives: A Policy Analysis
- o Children's Mental Health: Problems and Services
- o Public Perceptions of Biotechnology

In addition, the Division produced 14 staff papers and testified 10 times.

Listed below are several examples of direct legislative use of the Division's work:

Biological Applications

1. Several Senators, led by Senator Chiles, Chairman Subcommittee on Labor, Health and Human Services, Education, and Related Agencies, Senate Committee on Appropriations, relied extensively on the findings of OTA's report, Losing a Million Minds: Confronting the Tragedy of Alzheimer's Disease and Other Dementias, in their requests for funding provisions for Alzheimer's disease in P.L. 99-660, the Omnibus Health Act. The report has been widely cited as justification for legislation concerning Alzheimer's disease and other dementias at both state and federal levels. Because of expertise developed during this assessment, P.L. 99-660 stipulated that the Director of OTA appoint a citizens advisory panel on Alzheimer's disease to advise the Secretary of DHHS, a newly created interagency Council on Alzheimer's Disease, and the Congress.

   OTA staff for Losing a Million Minds worked jointly with the Congressional Clearinghouse on the Future to conduct a congressional staff briefing on the subject of federal policies related to dementia.

2. Staff of OTA's assessment of New Developments in Biotechnology provided materials and advice to the Senate Committee on Agriculture, Nutrition, and Forestry, as it prepared S. 970, the Alternative Agricultural Products Research Act of 1987 (now attached to the Trade Bill). The bill authorizes a research program for the modification of plants through biotechnology to develop nonfood, nonfiber uses of traditional crops.

   This large assessment is composed of several pieces that have been used by different committees:

   Findings from Ownership of Human Tissues and Cells prompted the Committee on Science, Space, and Technology to request that the Department of Health and Human Services review existing regulations for the protection of human subjects in research with respect to policy options outlined by OTA. DHHS responded that it favored the "Take No Action" option.

OTA testified before the Subcommittee on Hazardous Wastes and Toxic Substances, Senate Committee on Environment and Public Works, on information derived from its background paper, Public Perceptions of Biotechnology. OTA also testified before this subcommittee on Field Testing Engineered Organisms: Genetic and Ecological Issues, and briefed staff of the House Committee on Energy and Commerce, Subcommittee on Investigations and Oversight, and the House Committee on Science, Space, and Technology on background information, potential topics for oversight hearings, rosters of witnesses for hearings, and possible legislation related to release of genetically engineered organisms to the environment.

As part of the study of U.S. Investment in Biotechnology, OTA staff consulted with staff from the Senate Committee on Agriculture, Nutrition, and Forestry, and the Senate Committee on the Judiciary, Subcommittee on Technology and the Law in planning the committees' hearings on agricultural biotechnology, which were held in November 1987. OTA staff assisted congressional staff in the selection of witnesses and the preparation of questions for the hearings. Staff from the House Committee on Science, Space, and Technology have sought OTA staff expertise on agency biotechnology budgets as they conducted oversight investigations of agencies funding deliberate release field trials. Throughout the summer, OTA worked with staffs of Senators Domenici, Kennedy, and Chiles as they attempted to reconcile their respective versions of an Omnibus Biotechnology Bill.

Staff assigned to the study of Patenting Life assisted staff of the House Committee on the Judiciary, Subcommittee on Courts, Civil Liberties, and the Administration of Justice, in developing topic areas and identifying potential witnesses for their series of four hearings on patents and the constitution, with particular reference to patenting animals.

3. The House Committee on Science, Space, and Technology was assisted by staff of OTA's assessments of biotechnology and Mapping Our Genes during preparation of hearings, held July 1987, on medical applications of biotechnology.

4. As part of the ongoing assessment of Confronting Infertility, OTA presented testimony on the reproductive health of veterans to the Subcommittee on Hospitals and Health Care , House Committee on Veterans' Affairs, during its hearing on H.R. 3161, a bill to provide care for veterans with service-connected disabilities affecting procreation. Staff of the Senate Committee on Veterans' Affairs consulted periodically with OTA concerning S. 6, the Senate counterpart of H.R. 3161.

During the first session of the 100th Congress, OTA prepared rosters of potential witnesses for committees planning hearings on various aspects of infertility, including the House Select Committee on Children, Youth, and Families (Alternative Reproductive Technologies), the House Committee on Post Office and Civil Service, Subcommittee on Civil Service (Federal Employees Family Building Act), and the House Committee on Energy and Commerce, Subcommittee on Transportation, Tourism, and Hazardous Materials (Surrogate Motherhood).

Food and Renewable Resources

5. Publication of the OTA report, Technologies to Maintain Biological Diversity, was followed by two hearings on that subject, with OTA's testimony as the lead during the first hearing before the Subcommittee on Natural Resources, Agriculture Research, and the Environment, House Committee on Science, Space, and Technology. Several of the options for congressional action illustrated in the report were incorporated into draft legislation which was the topic of the second hearing. In addition, OTA staff suggestions were solicited to assist in the above hearings and in drafting legislation. OTA expects to provide additional support in refining the draft legislation.

6. The OTA report, Integrated Renewable Resource Management for U.S. Insular Areas, provided a congressional option outlining the need to establish a new Subcommittee in the House Committee on Interior and Insular Affairs. Later this committee established a new Subcommittee on Insular and International Affairs. One of their first activities was release of the OTA report to the public, during which the Chairman reported that consideration of the assessment options would be part of their first year agenda. Subsequently, the Subcommittee held two days of hearings on the report, with OTA testimony as the lead, designed to uncover insular and federal reactions to the report.

7. The OTA report, Continuing the Commitment: Agricultural Development in the Sahel, was used extensively during the bipartisan, bicameral staff discussions on reauthorization of the Foreign Assistance Act of 1961. These discussion took place over several months and OTA staff participated in several working groups throughout the period. OTA's findings and options were part of various legislative proposals and OTA suggested additional experts to draw into the process. Pending legislation would draw upon OTA for an evaluation of certain new provisions' effectiveness and for identifying private voluntary organizations that provide sound technical assistance. The House Committee on Foreign Affairs, Subcommittee on Africa, again drew upon this work when issues raised by OTA were included in oversight questions directed to the Agency for International Development.

8. The OTA report, Technology, Public Policy, and the Changing Structure of American Agriculture, has been used by the House Committee on Agriculture in considering amendments to the Food and Security Act of 1985. Specific amendments included changes in dairy, feedgrains, and credit titles. Information from the report was cited as rationale for not making changes in dairy and feedgrains titles. Information on agricultural credit has been used in debate of separate legislation to provide federal funds for the Farm Credit Association.

9. Staff of OTA's assessment of Technology and Public Policy to Enhance Grain Quality in International Trade has worked closely with the House and Senate Committees on Agriculture regarding potential changes in the Grain Quality Improvement Act of 1986. OTA staff is providing assistance to the committees in structuring hearings on the Act in early 1988.

Health

10. The congressionally-mandated Task Force on Technology Dependent Children has used OTA's technical memorandum, Technology Dependent Children, as the basis for its deliberations, adopting OTA's definition of technology dependence and its estimates of incidence and prevalence. OTA has also briefed staff of the Senate Committee on Finance on the study and responded to informal requests for assistance in developing legislation for such children under the catastrophic health insurance bill. Pending legislation (in the Budget Reconciliation package) mandates a more general OTA study of disabled and chronically ill children.

11. As part of its ongoing assessment of Healthy Children, OTA has held discussions and meetings with staff of the Senate Committee on Labor and Human Resources on coverage of preventive services for children under various legislative proposals. The results of the assessment regarding the potential of alternative preventive strategies for reducing health care costs or improving health outcomes for children are expected to be used in discussions regarding the bill dealing with preventive services that was recently introduced into the committee.

12. At the suggestion of the House Committee on Appropriations and with the support of the Technology Assessment Board, OTA established an AIDS-Related Activities project in June 1987, in order to anticipate and advise Congress on AIDS issues without necessarily waiting for Committee requests to conduct specific studies. On October 19, 1987, based partly on information provided to OTA by staff of the Subcommittee on Regulation and Business Opportunities, House Committee on Small Business, OTA assessed the accuracy of AIDS antibody testing, which pointed out the need to monitor laboratories performing AIDS antibody testing and the problem of significant errors in testing if populations with very small percentages of antibody-positive persons were to be tested. Introduction of legislation to monitor laboratories engaged in AIDS antibody testing is expected, and the OTA analysis will also be used in the continuing legislative debates on whether mandatory testing of selected populations is warranted or not.

13. A 1980 report on Compensation for Vaccine-Related Injuries played an instrumental role in passage of legislation in the 99th Congress to compensate for injuries from childhood vaccination programs. Establishing the funding levels was postponed until the 100th Congress. The Congressional Budget Office, based on OTA's analysis, estimated that over 200 cases would be compensated yearly. OTA, at the request of the House Committee on Energy and Commerce, reexamined its data and pointed out that the 200 cases represented OTA's high estimate, and that its best-guess estimate was 60-80 compensation cases yearly. The House decided to authorize payments for up to 150 cases per year.

14. OTA presented testimony in three House and Senate Committee hearings on the President's initiative on drug testing of the federal work force. OTA's testimony emphasized the variability initially allowed by federal agencies on whom to test and the types of drugs which could be tested for, and on the need for proficiency and certification programs for laboratories performing urine drug testing, because of past and current

studies on how poorly these labs have performed. OTA continues to advise congressional staff (e.g., Senate Committee on Veterans' Affairs) as the federal drug testing program is being implemented.

15. Publication of OTA's assessment of Indian Health Care led to requests for two follow-on studies. OTA produced a paper on Clinical Staffing for the House Committee on Energy and Commerce and later testified before that committee, as well as the House Committee on Interior and Insular Affairs and the Senate Select Committee on Indian Affairs. The House version of related legislation included the principal OTA suggestion that loan repayment through service in underserved areas rather than continuing with NHSC scholarships be adopted. OTA also studied the Health Status of Native Hawaiians, and its analysis and findings were used by the Senate Select Committee on Indian Affairs to introduce a bill to fund demonstration programs to improve the health of Native Hawaiians.

16. As a result of OTA's workshop and staff paper on Bone Marrow Transplantation Using Unrelated Donors, the House Committee on Energy and Commerce has proposed legislation (to amend the Organ Transplant Act) to transfer responsibility for a national registry of potential bone marrow donors from the Navy to the National Institutes of Health.

17. During preparation of the OTA case study, Nurse Practitioners, Physician Assistants, and Certified Nurse-Midwives: A Policy Analysis, OTA staff testified before the Subcommittee on Compensation and Employee Benefits, House Committee on Post Office and Civil Service, on whether the care provided by these practitioners was of sufficient quality to warrant direct reimbursement. The subcommittee was considering the issue of mandating reimbursement for these providers under the Federal Employees Health Benefits Program (legislation was introduced and reported out to the full committee). The House Committee on Energy and Commerce, Subcommittee on Health and the Environment, used a draft of the case study in preparing legislation regarding the issue of reimbursement for physician assistants. Legislation requiring reimbursement for physician assistants in specific settings was enacted as part of the Omnibus Reconciliation Act of 1986.

18. The House Committee on Government Operations, Subcommittee on Government Activities and Transportation, enlisted OTA's help in examining the medical records of private pilots who had been reissued licenses to fly by the Federal Air Surgeon despite continuing severe medical problems. OTA found that the Federal Air Surgeon personally intervened in appeals by private pilots previously denied flight status by FAA, did not follow established procedures for reviewing medical records, and reissued flight certificates without adequately documenting his reasons for doing so. Just prior to hearings in which OTA was to present its findings, the Federal Air Surgeon resigned, but OTA's analysis was published as a Committee print (House Report 100-54).

19. OTA has discussed its report on Identifying and Regulating Carcinogens with staff of the Senate Committee on Governmental Affairs, which is planning to hold hearings on regulatory reform, particularly concerning the Occupational Safety and Health Administration, in early 1988.

20. OTA's 1983 technical memorandum on Scientific Validity of Polygraph Testing and the FY 1987 staff paper updating that analysis were cited extensively in floor debate on H.R. 1212, the Employee Polygraph Protection Act.

21. The Senate Select Committee on Aging drew extensively from OTA's report, Payment for Physician Services: Strategies for Medicare, for hearings held November 2, 1987. Although recently announced increases in beneficiaries' premiums for Medicare Part B, which includes physician services, triggered the hearing, the Committee's interests stretched beyond that immediate issue to reform of Medicare payment for physician services. OTA submitted written testimony, which updated the analysis of the report. Chairman Melcher organized his opening statement and questions along the categories of payment options laid out in the OTA report and testimony.

22. OTA's staff paper, "The Costs of AIDS and HIV Infection: Review of the Estimates," provided background material for the continuing work of the Subcommittee on Health and the Environment, House Committee on Energy and Commerce, on AIDS issues. The Subcommittee requested the staff paper in order to analyze and evaluate widely differing cost estimates. As a follow-on to that staff paper, OTA has briefed Subcommittee staff on particular topics, such as the dearth of information on long-term care costs.

11.5 Changes in Prior Plans for FY 1987 and FY 1988 for the Health and Life Sciences Division

During Fiscal Year 1987, the Health and Life Sciences Division essentially accomplished its goals, with approved modification and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

During FY 1987, decreased availability of contracting dollars caused cutbacks in several projects, for instance: the infertility assessment eliminated a survey of U.S. in vitro fertilization; the grain quality assessment team was unable to visit and analyze the grain industry in China; the assessment of measuring quality of medical care had to forego a contract on consumer use of information about hospitals; and the AIDS project did not conduct a workshop in conjunction with a study of cost-effectiveness of AIDS education, which delayed the project by several months.

(Please see the chart on page 14 for the breakdown of the differences in estimated and actual Division spending for FY 1987.)

11.6 Priorities for FY 1989 for the Health and Life Sciences Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and

12.3 Role of the Science, Information, and Natural Resources Division

The Science, Information, and Natural Resources Division comprises 3 programs: Communication and Information Technologies; Oceans and Environment; and Science, Education, and Transportation.

The Communication and Information Technologies Program is concerned with technologies that create, read, store, manipulate, transmit, or display information. Primarily these are electronic technologies exemplified by computers and communications systems. The core responsibilities of the Program require monitoring the research and development of new information technologies and assessing the technological state of the art in these areas as well as trends in basic research and development. The Program also studies telecommunications regulation, information policy, and applications of information technology in the public sector.

The Oceans and Environment Program has responsibility for all ocean-related questions, including ocean resources and maritime policy, and for large-scale environmental issues, such as climate modification and water pollution. As a result of changing Congressional interest, the Program has developed capability for analyzing the difficult questions in which the overriding concern lies with the environmental effects of decisions. The work of the Program usually falls under one of five basic categories: federal services, natural resources, pollution control, marine industry, and large-scale environmental issues.

The Science, Education, and Transportation Program is responsible for principal work in the broad areas of science policy (basic research direction and resource allocation), education (education in grade K through graduate school and programs for adults not based on job skills), and the more technology specific area of transportation. For purposes of Program development: (1) "science" includes issues surrounding the health of the scientific enterprise; (2) "education" refers to in-school and other methods, practices, and philosophy for people from early childhood through adult; and (3) "transportation" refers to all modes of transport - vehicular, rail, air, and water.

12.4 Accomplishments of the Science, Information, and Natural Resources Division

In FY 1987, the Science, Information, and Natural Resources Division published 4 full assessments:

- The Border War on Drugs
- Wastes in Marine Environments
- Marine Minerals: Exploring Our New Ocean Frontier
- The Electronic Supervisor: New Technology, New Tensions

The Division also published 1 special report and 1 background paper:

- The Social Security Administration and Information Technology (Special Report)
- Science, Technology, and the Constitution

In addition, the Division prepared 6 staff papers and testified 12 times.

Listed below are several examples of direct legislative use of the Division's work:

Communication and Information Technologies

1. OTA's report on Electronic Record Systems and Individual Privacy was used as background information in connection with the Senate debate on and enactment of the Computer Matching and Privacy Protection Act, and was and continues to be used in connection with House consideration of similar legislation.

2. OTA's report on Federal Government Information Technology: Management, Security, and Congressional Oversight was used as background information in connection with Senate and conference committee consideration of and ultimate congressional enactment of amendments to the Paperwork Reduction Act. Several of the amendments were based significantly on the results of the OTA study.

3. OTA's report on Electronic Surveillance and Civil Liberties was used as background information in connection with House and Senate consideration of and ultimate enactment of the Electronic Communications Privacy Act.

4. OTA's technical memorandum on Scientific Validity of Polygraph Testing was used in connection with House and Senate consideration of various bills proposed to regulate use of polygraph tests for employment screening purposes.

5. OTA's report, Hospital Information Systems at the Veterans' Administration, was used by the House and Senate Appropriations and Veterans' Affairs Committees to help their consideration of a VA request for funds for a major computer procurement. Beyond evaluating current activities, the study also recommended that planning start now for the next implementation.

6. OTA testified to House and Senate Judiciary Committees and to the Senate Committee on Commerce, Science, and Transportation in their consideration of legislation of requiring encoder chips on Digital Audio Tapes. The testimony, based on OTA's report, Intellectual Property Rights in an Information Age, suggested several issues that might merit study before such a bill was passed. Some of the technical questions raised by the OTA are now being investigated by the National Bureau of Standards.

7. OTA testimony before the House Committee on Government Operations assisted them in their consideration of H.R. 145, a bill that assigns to the National Bureau of Standards responsibility for civilian communications security. H.R. 145 was reported out of committee, has passed the House, and is now under consideration in the Senate. The Senate Committee on the Judiciary has requested several copies of the report and is using it in their consideration of the bill.

8. Testimony before the House Committee on the Judiciary based on OTA's report, The Electronic Supervisor, assisted them in consideration of H.R. 1955, a bill to require a beeper tone on the line when employee telephone calls are monitored by employers.

9. A staff paper based on OTA's work on Criminal Information Systems is helping the House Committee on the Judiciary in its oversight of the FBI's planning for a new computer system for its National Criminal Information Center.

Oceans and Environment

10. Twenty-nine Senators requested that OTA analyze the costs and air quality benefits of a bill to amend the Clean Air Act. OTA was able to respond to this request in a timely fashion by using models and data collected as part of its ongoing assessment, New Clean Air Act Issues. OTA's staff paper analyzing the provisions of the bill addressing ground-level ozone was extensively used during markup of the bill by the Senate Committee on Environment and Public Works.

During this same markup, OTA staff worked closely with committee staff, helping them analyze potential changes to the acid rain provisions of the bill. OTA's 1984 assessment of Acid Rain and Transported Air Pollutants was the source of the information needed to assist the committee.

11. At the conclusion of the assessment of the Border War on Drugs, OTA testified before the Permanent Subcommittee on Investigations of the Senate Committee on Governmental Affairs. The hearings focused on the implementation of the Anti-Drug Abuse Act of 1986 and the results of Federal drug interdiction efforts as well as certain reports to the Congress mandated by the 1986 Act. OTA released its report at these hearings and testified first — giving an overview of the drug smuggling problem and findings from the study. OTA also supplied extensive responses to written questions and supporting data following the hearings.

Later, OTA testified before the Senate Committee on the Judiciary on several issues, including the impact of federal drug interdiction programs, federal strategies to control drug smuggling, measures of effectiveness and the roles of the federal agencies involved. The Committee was considering a bill, S. 789, the National Narcotics Leadership Act of 1987. OTA's testimony and report was used by the Committee in evaluating present problems with federal drug enforcement and potential for making improvements.

12. In response to OTA's assessment of Wastes in Marine Environments, one bill, H.R. 2240, was introduced and another one is being designed. OTA staff provided extensive, informal comment on these legislative proposals. Staff of the House Committee on Merchant Marine and Fisheries is now laying the groundwork for legislative activities on this subject in the next session of Congress, and it is seeking OTA assistance in this regard.

13. OTA's 1985 report, Managing the Nation's High Level Radioactive Waste, and testimony based on that analysis were cited extensively in floor debate in the Senate on S. 1668, a bill to redirect the program for disposal of spent nuclear fuel and high level radioactive waste under the Nuclear Waste Policy Act of 1982, and on H.R. 2700, the FY 1988 appropriations bill for energy and water development.

Science, Education, and Transportation

14. As part of its ongoing assessment, Educational Technology: Practice and Potential, OTA prepared a staff paper on "Trends and Status of Computers in Schools: Use in Chapter 1 Programs and Use with Limited English Proficient Students." The House Committee on Education and Labor and its Subcommittee on Elementary and Secondary Education used the staff paper in preparing legislative language and the Committee report for the reauthorization of Chapter 1 and Bilingual Education Act. (H.R. 5, the School Improvement Act of 1987) Staff from both the House and Senate Education Committees were provided information about the use of technology to deliver instruction to remote sites. OTA provided information to the Senate Committee staff as they prepared the "Star Schools" proposal (S. 406 Education for a Competitive America Act), and talked to House Committee staff preparing educational sections in the trade bill (H.R. 3, Trade and International Policy Reform Act of 1987).

15. OTA has provided information continuously to congressional committees about its ongoing assessment, Aviation and Motor Carrier Safety in a Competitive Environment. OTA was the lead witness for hearings on motor carrier safety held by the Surface Transportation Subcommittee of the House Committee on Public Works and Transportation, and a key witness for the aviation hearings on maintenance held by the Subcommittee on Oversight and Investigations. OTA staff briefed Committee staff in advance to help them prepare for these and several other hearings.

16. Publication of the OTA report, Transportation of Hazardous Materials, in July 1986 had several major legislative results. Title III of the Superfund reauthorization (P.L. 99-499) included community right-to-know and community planning requirements that followed closely the issue approaches in the OTA special report, Transportation of Hazardous Materials: State and Local Activities, and policy options in the full report. In addition, the Drug Control bill passed at the end of the 99th Congress contained a provision requiring states to adopt federal standards for a single commercial driver's license for truck drivers (Title XII of Public Law 99-570). The requirements of the bill paralleled the conclusions of the report closely. Furthermore, OTA staff was consulted by the staff of the Senate Committee on Commerce, Science, and Transportation during the drafting stages of the legislation and participated as reviewers and advisers throughout the legislative process until passage. OTA was also contacted for advice on the driver licensing bill by the staff of the House Committee on Public Works and Transportation.

In April 1987, OTA staff briefed the new staff of the Senate Committee on Commerce, Science, and Transportation on hazardous materials issues and suggested numerous witnesses for a planned series of three

hearings on the subject. OTA was the lead witness (with the exception of Senator Wirth) and the Committee staff had followed OTA's suggestions very closely.

The Senate has debated reauthorization of the Hazardous Materials Transportation Act. The OTA assessment was quoted extensively by Senator Stafford during floor debate on Amendment 217 to S. 1269, which was to make grants to state and local governments to provide for emergency planning, preparedness, mitigation, response, and recovery capabilities. The House has not yet acted. Throughout the entire year, OTA has provided information to numerous congressional offices on this issue.

In a related activity, OTA provided written commentary to the request from Chairwoman Cardiss Collins, of the Subcommittee on Government Activities and Transportation of the Committee on Government Operations, on a risk assessment on transportation routes completed by the Department of Defense for shipments of nitrogen tetroxide (rocket fuel).

17. OTA briefed the staff of the Senate Committee on Environment and Public Works three separate times during preparation of the staff paper on Construction and Materials Research and Development for the Nation's Public Works. We also provided suggestions for names and issues as the Committee was planning its hearings, at which OTA testified in October.

12.5. Changes in Prior Plans for FY 1987 and FY 1988 for the Science, Information, and Natural Resources Division

During Fiscal Year 1987, the Science, Information, and Natural Resources Division essentially accomplished its goals, with approved modifications and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 14 for the breakdown of the differences in estimated and actual Division spending for FY 1987.)

12.6. Priorities During FY 1989 for the Science, Information, and Natural Resources Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the

U.S. House of Representatives
Committee on Science
Hearing On
Scientific and Technical Advice to Congress

Witness:
Congressman Rush Holt

Questions For the Record

Appendix E

Office of Technology Assessment
Justification of Estimates
Submitted to the
Subcommittee on Legislative Branch Appropriations
1990

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Office of Technology Assessment
U.S. Congress

Fiscal Year 1990
Justification of Estimates

NOT FOR DISTRIBUTION UNTIL AFTER HEARINGS ON LEGISLATIVE APPROPRIATIONS

Submitted to

Subcommittee on
Legislative Branch Appropriations

December 16, 1988

4. Overview of OTA's Role

What can be done about AIDS? Can we slow global warming? What is the future of the manned space program? Can the U.S. sustain a competitive edge in emerging industries such as superconductivity and biotechnology? Congress must address these issues, but must act under conditions of imperfect knowledge. Science and technology figure prominently in such questions, yet what scientists can state with certainty is not, unfortunately, all that Congress needs to know. That's where OTA comes in.

Experts disagree (e.g., there are scientists on both sides of the SDI debate). Stakeholders make conflicting claims (e.g., consumer groups and electric utilities often differ on nuclear power). OTA explores these complexities and tells Congress why ... we explain the bases of disagreement. To assure quality, accuracy, and fairness for each assessment it undertakes, OTA convenes an advisory panel composed of the experts and stakeholders on the issues at hand: these advisors range from academicians to industrial scientists, from private entrepreneurs to public interest advocates. Given this diversity of views, the OTA staff and the panel very quickly are able to identify and set aside those factors on which there is general agreement, the scientific certainties; then the real work begins.

Reasonable people of various political philosophies may well approach S&T policy differently, but debates are more meaningful, choices better considered, when facts are clearly distinguished from speculation, when "truth" and "belief" are delimited. As it explores complex technology, OTA identifies areas of consensus, describes remaining technical uncertainties, and charts several possible legislative courses through the assessment issues. Our studies demarcate well-settled and unsettled issues in science and technology, thereby helping to focus congressional debate.

The bipartisan, bicameral Technology Assessment Board — a critical element in OTA's reputation for objectivity — has approved studies for the coming year that consider the short- and long-term consequences of technological development: from monitoring the Nevada test site, to maintaining the defense technology base; from copyright and home copying, to information technology and research; from managing municipal solid waste, to climate change. OTA will continue to conduct new analyses and provide follow-on information from completed assessments, working with committees to help Congress understand the potential impacts of new technologies as well as the problems and opportunities that might arise from technologies currently in use.

5. OTA's Accomplishments During Fiscal Year 1988

During FY 1988, OTA published 20 assessment reports and 11 special reports. OTA also delivered 1 Technical Memorandum and 6 Background Papers (including 1 Case Study). (See pages 85-96.) As of September 30, 1988, 35 Technology Assessment Board (TAB) approved studies were in progress and 4 were in press.

As an integral part of carrying out assessments, OTA also provides, during the course of a project as well as after its delivery, expert advice,

briefings, testimony, and results of OTA assessments to Committees matched to their specific needs and the Congressional agenda. (See pages 142-148.)

The reports represent comprehensive synthesis and analysis on some of the most controversial and costly issues faced by Congress ... covering, for example, hazardous waste reduction and management, international trade and technology transfer, the future of American agriculture, the technology for defensive weapons, health care cost containment, and the future of biotechnology. These studies directly reflect the expressed needs and priorities of Committees of House and Senate. **During the year, OTA served over 80 different Committees and Subcommittees of both houses, typically in response to bipartisan requests.**

Relation of Work to Legislative Activities

OTA's role is neither to promote nor to discourage the development or the application of any particular technology or legislation but rather to help Congress determine whether or when some form of Federal government participation may make sense. OTA helps identify and clarify options; exposes misleading and incorrect information; and helps raise the level of understanding in the debate about expensive and controversial technical issues.

In each section on OTA's divisional accomplishments, we identify some activities during fiscal years 1988 and 1989 to date that illustrate the link between OTA's work and specific Congressional activity. Please see the following pages for this information:

page

Energy, Materials, and International Security Division
- Energy and Materials 30
- Industry, Technology, and Employment 31
- International Security and Commerce 32

Health and Life Sciences Division
- Biological Applications 45
- Food and Renewable Resources 48
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Science, Information, and Natural Resources Division
- Communication and Information Technologies 63
- Oceans and Environment 64
- Science, Education, and Transportation..... 65

Mandate Avoidance

OTA works closely with members of TAB and the Appropriations Committees to maintain the authority of the Board to determine the agenda of the agency and the best use of OTA's limited resources for the whole of Congress. Because demand for OTA assistance exceeds the resources made available to the agency, some committees attempt to initiate studies through new legislation rather than request studies through the Board (as was contemplated in OTA's enabling legislation). Mandates are strongly discouraged as a mechanism to obtain OTA's help, and attempts to mandate are frequently avoided by our ability to work with the interested parties prior to introduction of bills.

But during the 100th Congress a number of bills were introduced that would have mandated activities for OTA. For example:

H.R. 3471 (P.L. 100-527)	Requires OTA to provide information we consider useful to a new Commission on Executive Organization
H.R. 3300	Would have required the Director of OTA to prepare a report regarding hazardous waste reduction and management to be submitted to EPA.
H.R. 3499	Would have required OTA to comment on the reports of the Subseabed Consortium and provide Congress with an independent analysis of each such report.
H.R. 4290	Would have required OTA to do a comprehensive study on economic incentives and disincentives provided by Federal and State governments which affect competition between recycled and virgin materials. Would also require a study of recycling operations in foreign countries to determine if any programs utilized in those countries may be implemented in the United States.
H.R. 4741	**Senate Engrossed Amendment** Would have required OTA to consult with the Administrator of the VA on disabilities related to exposure to certain herbicides or to service in Vietnam and on a tissue archiving system
H.R. 5460	Would have established a National Commission on Population, Environment, and Natural Resources, and made the Director of OTA a member of the Commission, which is empowered to initiate such research, prepared such reports to the President and Congress, and convene such conferences as it determines necessary.
H.R. 5469	Would have required OTA to assist EPA in the design of a study of the feasibility of in-use emissions standards for new vehicles.
H.R. 5534	Would have required OTA to conduct a study of the need for and safety of genetic research involving the human deficiency virus which causes acquired immune deficiency syndrome
S. 1966	Would have required that the Director of OTA appoint an OTA staff member to the New Products Research Board.
S. 2382	Would have required OTA, in consultation with IHS, to conduct a study to determine the impact of rules that would change the eligibility criteria for services of the Indian Health service and submit the report to Congress within 2 years of the date of enactment of the bill.
S. 2867	See H.R. 5460
S. 2902	Would have required OTA to conduct at study of ambulance service costs and charges utilizing as a data base information developed by PhysPRC and develop a recommended fee schedule
S. 2912	Would have required one OTA employee to serve as a Trustee for the National Center for Preservation Technology

OTA works closely with many committees to fulfill their requests for information through accepted channels. Efforts to avoid mandates may become more difficult as OTA's budget becomes tighter and the agency is forced to

refuse or curtail a greater number of requests, even when made through proper channels.

Mandated Activities

Despite efforts to avoid mandates, over the past several years OTA has undertaken several projects as a result of legislative mandates. Our ongoing activity, Monitoring of Mandated Vietnam Veteran Studies (mandated by P.L. 96-151) was the first piece of "legislated" work. OTA's work in this area led to additional mandates: P.L. 98-160 requires that OTA monitor certain federal research activities with regard to veterans exposed to atomic radiation; P.L. 99-272 requires that OTA monitor certain federal research activities with regard to women veterans.

There have also been recent mandates for full assessments. In FY 1986, OTA delivered an assessment, Payment for Physician Services, mandated by P.L. 98-369. OTA's assessment of the Strategic Defense Initiative was mandated by P.L. 99-190; a classified version of this report was delivered to appropriate committees in September 1987 (an unclassified version was released in June 1988).

The 100th Congress also produced legislation that requires special analytical responses from OTA. P.L. 100-180 required OTA's participation in a Conventional Defense Study Group that assessed the balance of conventional forces in Europe between the forces and NATO and the forces of the Warsaw Pact. The Comptroller General, leader of the study group, requested OTA to convene a workshop on Soviet views of the conventional balance in Europe, and the proceedings of that workshop are currently in press.

P.L. 100-435, enacted during the second session, requires OTA to develop model performance standards, and review those actually developed by the Secretary of Agriculture, with regard to employment and training requirements within the food stamps program. A report to the Speaker, the President Pro Tempore, and the Secretary of Agriculture on the comparison/review is required.

P.L. 100-576 expresses the sense of the Congress that OTA should: 1) cooperate in a study of regional programs for the Ganges basin and the Brahmaputra basin designed to assure water quality and supply; and 2) prepare a synopsis of the current literature on flood control in those basins and state-of-the-art flood control technologies and of cost benefit analysis efforts.

OTA has also been assigned the task of appointing health-related commissions. P.L. 99-660 mandated the OTA Director to appoint a citizens' Advisory Panel on Alzheimer's Disease. This mandate does not include any reporting requirements for OTA. However, OTA is required to appoint and monitor the activities of three additional commissions (see below).

Prospective Payment Assessment Commission (ProPAC)

The Commission is an independent advisory Committee mandated under the "Social Security Amendments of 1983" (Public Law 98-21, Section 601) that reform the Medicare program payment method.

Under the Statute, the OTA Director is charged with selecting the Commission members. Initial Commissioners were appointed in 1983. Five Commissioners' terms expired in March 1988, and the Director made three reappointments and two new appointments.

OTA is also required to report to Congress annually on the functioning and progress of the Commission. The fourth of these reports was issued this past year. A panel of outside experts was selected to assist in this process.

Physician Payment Review Commission (PhysPRC)

The Physician Payment Review Commission is also an independent advisory committee mandated under the Consolidated Omnibus Budget Reconciliation Act of 1985 (P.L. 99-272). PhysPRC's purpose is to advise Congress and the Executive Branch on possible ways of reforming physician payment under the Medicare program.

As with ProPAC, the OTA Director is statutorily charged with selecting the Commission members. Initial appointments to the 13-member Commission were made in 1986, for terms ranging from one to three years. In April of 1988, the Director reappointed three Commissioners and appointed one new Commissioner. An annual report is also required on PhysPRC, and the second of these reports was issued in November 1988.

Prescription Drug Payment Review Commission (PDPRC)

The Prescription Drug Payment Review Commission (PDPRC) is another independent advisory committee mandated under the Medicare Catastrophic Coverage Act of 1988 (P.L. 100-360). The Commission is mandated to report to Congress by May 1 of each year, beginning in 1990, concerning methods of determining payment for outpatient drugs covered under the new law.

As with the other commissions, the Director of OTA is charged with selecting the initial 11 Commission members and making replacement appointments each year. The initial selections are being made in December 1988. OTA is also required to report annually to the Congress on the functioning and progress of the Commission, and we anticipate that the first such report will be issued in 1989.

Interagency Coordination

In carrying out OTA's mission as a shared resource to the Committees of the Congress, our staff cooperate and interact extensively not only with congressional Members and staff, but also with staffs of other federal agencies, as well as with the private sector and universities. This extensive networking not only serves to avoid duplication but also helps to increase Congress' analytical resource base and enables OTA to utilize the most up-to-date information available. As a consequence, a typical OTA assessment, costing $500,000, draws heavily upon the work of others that, taken together, could cost many times more.

While the principal use of OTA is by the Congress, it is not uncommon for OTA reports to have a direct impact on Executive Branch activities, for instance: Several offices have noted the value of OTA's report, Power On! New

Tools for Teaching and Learning, to their programs, including the Federal Interagency Committee on Education, the Undersecretary of the Department of Education, the Education Research Library, and the Office of Studies and Program Assessment of NSF. The Federal Aviation Administration used OTA's report, Safe Skies for Tomorrow, as guidance in reorganizing its research programs, and OMB used information from Safe Skies and its companion report, Gearing Up for Safety, in preparing position papers. Senior staff of the National Technical Information Service are using OTA's report, Informing the Nation, as a central point of reference in developing plans for the future of NTIS in response to congressional directives. The African Development Foundation implemented the findings of OTA's report, Grassroots Development: The African Development Foundation, in eight substantive areas, and the Agency for International Development has used OTA's assessment methods to evaluate development assistance projects in Nepal and Burkina Faso. Based on the profile of the biotechnology industry presented in U.S. Investment in Biotechnology, the Internal Revenue Service consulted with OTA in their development of specifications for auditing biotechnology companies, and the Federal Emergency Management Agency consulted that project's staff in planning for medical readiness and options for creating incentives for pharmaceutical production in the event of a national emergency. The U.S. Department of Commerce used OTA's report, Technologies for Historic and Prehistoric Preservation, extensively in the design of its cooperative agreement with the State of Maryland to preserve underwater archeological sites. OTA worked closely with the National Science Foundation to initiate a survey of nearly one thousand U.S. and Japanese firms involved in superconducting materials research and applications development. OTA briefed President Reagan's "Wise Man Group" and the Air Force Scientific Advisory Board on the results of our work on high temperature superconductivity commercialization. OTA participated in a meeting organized by the Office of Science and Technology Policy for the Department of State to plan implementation of the U.S.-Japan Bilateral Science and Technology Agreement. OTA's assessments, Serious Reduction of Hazardous Waste, and From Pollution to Prevention: A Progress Report on Waste Reduction, and extensive follow-on activity has helped to influence EPA to form an Office of Pollution Prevention. Vice President Bush's Task Force on Border Control requested and received background information and additional reports to supplement OTA's 1987 study, The Border War on Drugs.

Over the past several years, OTA and the three other Congressional support agencies have adopted a process to more fully utilize each other's expertise. This is as true in administrative areas as program areas; for instance, the Library of Congress provides accounting and disbursing services to OTA on a reimbursable basis, CRS provides access to the SCORPIO database and other research assistance, and GAO provides legal advice and opinions. CBO, CRS, and GAO staffs coordinate with, and, in some cases, participate in OTA advisory panel meetings, symposia, and workshops. The four agencies share information on related studies and provide new data as input to each others' projects as appropriate to their areas of expertise. In addition, two or more agencies may collaborate in the preparation of testimony or general assistance for Congressional hearings. Examples from 1988 include: 1) plenary coordination meetings on tax policy, the Arctic National Wildlife Refuge, AIDS, infrastructure, and SDI; 2) sharing staff and analysis between OTA, CRS, and GAO on airline safety issues; 3) a workshop on "Priority Setting for Science" jointly hosted by OTA and CRS; 3) GAO conducted surveys that provided

useful input to OTA's analysis of federal information dissemination; 4) CRS helped plan and prepare for OTA's workshop on pesticide residues in food; 5) CRS translated OTA documents into French during the course of OTA's work on grassroots development in French-speaking West Africa; 6) OTA and GAO exchanged statistical information throughout OTA's study on measuring the quality of physicians and hospitals; 7) a CRS analyst is participating in OTA's study of the defense technology base and producing written materials that will be available through each agency; 8) OTA conducted one of the workshops planned in response to the mandate for the 4-agency Conventional Defense Study Group; 9) regular meetings between OTA, CRS, GAO, and CBO on trade issues; 10) OTA participated in two mock congressional hearings run by the CRS Graduate Legislative Institute, testifying on high temperature superconductivity; 11) OTA assisted the Library of Congress with their plans for a deacidification facility following the release of OTA's report, Book Preservation Technologies; 12) CRS is providing staff support on a part-time basis for OTA's assessment of Antarctic mineral potential.

6. Changes in OTA's Prior Plans for FY 1988 and FY 1989

During Fiscal Year 1988, OTA essentially accomplished its goals, with approved modifications, negotiated reductions, and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to make adjustments, and also the fact that the agency must operate with fewer resources.

The chart below shows the variations in actual obligations for the OTA divisions for FY 1988 from the planned obligations for FY 1989 provided on Schedule A in the FY 1989 budget justification. The chart on page 16 provides a summary by object class of projections and actual expenditures for FY 1988 and is followed by an explanation of variations of more than 10% or $100,000.

Changes in OTA's Prior Plans
($000)

	1988 (est.)	1988 actual	% change
Division A	3,980	3,939	(1.03)
Division B	3,980	3,911	(1.73)
Division C	3,980	3,909	(1.78)
Division G	4,961	5,092	2.64

10.3. Role of the Energy, Materials, and International Security Division

The Energy, Materials, and International Security Division comprises three Programs: Energy and Materials; Industry, Technology, and Employment; and International Security and Commerce.

The Energy and Materials Program is responsible for assisting the Congress in understanding the technological possibilities for developing our energy and materials resources and the consequences of these developments for society. In this way, the Program can help the Congress ensure rational resource development such that economic growth is maintained, undesirable side effects are kept to a minimum, and the resource base is sustained for future generations. The Program covers those technologies that concern the extraction, delivery, and use of energy and materials. Although primarily directed at domestic resources, the Program also is concerned with world markets and policies, including imports and exports of energy and materials.

The Industry, Technology, and Employment Program examines how technology affects the ability of U.S. industry to contribute to a healthy national economy. Its responsibilities include consideration of the competitiveness of U.S. industries in international markets, the number and nature of employment opportunities, needs for worker education, training and retraining, and ways to ease adjustment in structural economic transitions. A Program with a specific employment focus is new at OTA (the Program was established in 1983), although most assessments have considered employment impacts, and employment and training issues have been of central importance in several studies. ITE's employment concerns center on the quantity, nature, and quality of jobs, the nature of and changes in job skills, and training and retraining across the work force.

The International Security and Commerce Program deals with national security, space technology, international relations generally, and international technology transfers. The Program's work in national security involves determination of what is technologically possible followed by an assessment of the likely impacts of these technological considerations on national security, which includes international stability, diplomacy, alliance relations, and arms control, as well as deterrence and defense. The work on space technology involves a range of issues, such as space transportation, international cooperation and competition in civilian space activities, and newsgathering from space, in which technological progress, civilian exploration, commercial uses of space, and national security must be reconciled. ISC's work in technology transfer combines several perspectives: the national security and foreign policy considerations that lie behind export controls, a concern for the health and competitiveness of U.S. industry in international markets; and a concern for the objective of managing technology transfer in such a way as to contribute to favorable international economic development.

10.4. Accomplishments of the Energy, Materials, and International Security Division

In FY 1988, the Energy, Materials, and International Security Division published 6 assessment reports:

- Star Power: The U.S. and the International Quest for Fusion Energy

- o Technology and the American Economic Transition
- o Seismic Verification of Nuclear Test Ban Treaties
- o SDI: Technology, Survivability, and Software
- o Advanced Materials by Design
- o Competitiveness of the U.S. Domestic Copper Industry

The Division also produced 5 special reports and 1 technical memorandum:

- o The Defense Technology Base: Introduction and Overview
- o Are We Cleaning Up? 10 Superfund Case Studies
- o Commercializing High-Temperature Superconductivity
- o Paying the Bill -- Manufacturing and America's Trade Deficit
- o Launch Options for the Future: A Buyer's Guide
- o Reducing Launch Operations Costs: New Technologies and Practices (TM)

In addition, the Division testified 21 times and prepared 1 staff paper.

Listed below are several examples of direct legislative use of the Division's work:

Economic Transition

1. The Chairman of the Subcommittee on Energy and Power, House Committee on Energy and Commerce, cited Technology and the American Economic Transition as a document that "contains a wealth of information and has been very useful in our understanding of the economy and its likely future direction."

2. OTA issued a special report, U.S. Textile and Apparel Industry: A Revolution in Progress, that was cited extensively during floor debate on the Amended Textile and Apparel Trade Act of 1988, particularly the finding that "despite the optimism made possible by technical progress, U.S. textile and apparel firms are in danger ... in spite of these remarkable advances, the industry is gravely threatened."

3. Four bills concerned with the effects of energy consumption on climate change -- S. 1554, S. 2667, H.R. 4505, and H.R. 5380 -- state that "the Office of Technology Assessment has found that the technological innovations that could improve the quality and reduce the cost of housing in the United States are being needlessly slowed by inadequate research and development. The study referenced is Technology and the Future of the U.S. Construction Industry.

Energy and Materials

1. H. Con. Res. 242 cited a statement from Starpower: The U.S. and the International Quest for Fusion Energy that the Department of Energy now sees more intensive international collaboration as a financial necessity.

2. Senator Domenici referred extensively to OTA's report, Copper: Technology and Competitiveness, in the debate on whether to add copper to the Steel and Aluminum Energy Conservation Act of 1988, which promotes joint government and industry research and development efforts.

3. The findings of OTA's report, Advanced Materials by Design, were used extensively in the context of hearings on oversight of the National Critical Materials Act of 1984 convened by the Subcommittee on Transportation, Aviation and Materials, House Committee on Science, Space and Technology and by the Senate Committee on Commerce, Science, and Transportation. OTA's report provided an important perspective for the committees' evaluation of the role of the National Critical Materials Council in coordinating Federal agency materials research and development.

4. In the report, New Electric Power Technologies: Problems and Prospects for the 1990's, OTA evaluated a wide range of developing generation and load management technologies and provided Congress with a means to evaluate current R&D programs. The report continues to be used widely by energy R&D authorizing committees as a reference source for this area. This report and several related staff papers have been used widely in the course of hearings on the implications of alternatives to fossil fuel technology on global warming for the Senate Committee on Energy and Natural Resources and the House Committees on Science, Space and Technology and on Energy and Commerce.

5. OTA's staff memo, Effects of Replacing Lead with Aromatic Versus Alcohol Octane Enhancers in Gasoline, continues to be requested by staff of various committees and individual members' offices concerned with policy initiatives to develop alcohol fuels, including the House Energy and Commerce Committee and the House Agriculture Committee.

Industry, Technology, and Employment

1. During floor debate on H.R. 3048, the National Superconductivity and Competitiveness Act of 1988, the Chairman of the House Committee on Science, Space, and Technology quoted, from Commercializing High-Temperature Superconductivity, OTA's finding that "Japanese companies could well come out ahead in the race to commercialize superconductivity." This report was also the subject of testimony before the Senate Committee on Governmental Affairs and was highly commended by the Chairman.

2. Information from OTA's special report, Plant Closings: Advance Notice and Rapid Response, was cited during floor debate on the advance notice provisions of the trade bill, including reference to an OTA estimate that the bill could save up to $300 million in unemployment compensation costs, and OTA's finding that "the best time to start a project for displaced workers is before a plant closes or mass layoffs begin."

3. OTA's work on Superfund Implementation was cited, by the Chairman, as particularly valuable to the oversight efforts of the Subcommittee on Superfund and Environmental Oversight, Senate Committee on Environment and Public Works. OTA assisted congressional oversight efforts by testifying at 6 Senate and House hearings, and OTA continues continues to be asked to review newly issued EPA studies on specific Superfund sites.

   OTA's other work on hazardous waste management, particularly Serious Reduction of Hazardous Waste, was influential in Congress's decision to appropriate special funds for EPA's waste reduction activities, including special R&D funds and a State grants program.

4. P.L. 100-436, making appropriations for the Departments of Labor, Health and Human Services, Education, and related agencies for the fiscal year ending September 30, 1989, cites OTA's assessment, Technology and Structural Unemployment: "The Congress is concerned with the findings of the Office of Technology Assessment that 25 million workers will have to upgrade their job skills by the end of this century. Accordingly, the Congress directs the Secretary to give priority to funding pilots and demonstrations and research, development, and evaluation programs that will address this urgent National priority."

5. In his support of H.R. 2020, Senator Lautenberg portrayed Title III of the bill, the Waste Reduction Act of 1988, as directly responsive to OTA's 1987 report, From Pollution to Prevention: A Progress Report on Waste Reduction. The Senator stated that, "The Waste Reduction Act addresses the information shortcomings identified by OTA and provides the legislative backbone for a source reduction program." OTA's found that: 1) a 10% reduction for each of the next 5 years is achievable; 2) source reduction efforts proceed slowly because industry lacks information about the opportunities and benefits of hazardous waste source reduction; and 3) EPA has been slow to recognize the importance of source reduction, were also cited.

International Security and Commerce

1. The Chairman of the House Committee on Armed Services cited OTA's report, New Technologies for NATO, as an example of the importance and value of OTA's studies, in that "they often provide a valuable synthesis of technical material contained in a wide variety of studies by the Executive Branch, the military services, and their contractors." That Member's views were mirrored by many officials in NATO, the U.S. military, and other Executive Branch offices.

2. OTA's special report, The Defense Technology Base: Introduction and Overview, served as the basis for hearings in March 1988 by the Subcommittee on Defense Industry and Technology, Senate Armed Services Committee.

3. Seismic Verification of Nuclear Test Ban Treaties was the subject of hearings by the Subcommittee on Arms Control, International Security, and Science, House Armed Services Committee, and was a major input into hearings by the Senate Foreign Relations Committee.

4. Staff of the report, SDI: Technology, Survivability, and Software, gave several classified briefings to Members and to committee staff while awaiting the completion of classification review; then provided unclassified briefings to the SDI panel of the House Committee on Armed Services.

10.5. Changes in Prior Plans for FY 1988 and FY 1989 for the Energy, Materials, and International Security Division

During Fiscal Year 1988, the Energy, Materials, and International Security Division essentially accomplished its goals, with approved

11.3. Role of the Health and Life Sciences Division

The Health and Life Sciences Division comprises 3 programs: Biological Applications; Food and Renewable Resources; and Health.

The Biological Applications Program assesses state-of-the-art technologies arising from the cutting edge of biological science. Its broader responsibility is to help Congress understand complex technologies in biomedical sciences. Early warning is very much a part of the Program's charter, and some studies explore potential future applications of biological technologies. Because many of these new technologies have potential impacts that are of great social and political significance, ethical analysis is often a component of the assessments conducted by the Program.

The scope of the Food and Renewable Resources Program includes all agriculture-related technologies used to provide society with food, fiber, and chemicals, and technologies that enhance or jeopardize the ability to sustain in perpetuity the renewable resource bases that make such production possible. Agriculture itself is defined in the broad sense, including all crop and livestock production and forestry. Attention also is given to the impact that technology has had and is likely to have on how the agricultural system is organized, who controls it, and where it is heading. Further, the Program covers renewable resources that presently may not be considered or produced as crops, but that support such production and are fundamental to human needs.

The charter of the Health Program, the analysis of technological applications that affect human health, is reflected in three primary types of efforts: 1) assessments of clinical and general health care technologies and related policy areas; 2) assessments in the area of environmental and occupational health; and 3) collaboration with, and assistance to, other Programs on health-related issues in projects. The relationship of health care technology to financing, organization, and systems issues is a growing area of Program activity due to increased and focused Congressional interest. The Program's responsibilities include mandated reviews of protocols for monitoring of the conduct of studies of Agent Orange and of health effects among military personnel exposed to atomic bomb tests.

11.4. Accomplishments of the Health and Life Sciences Division

In FY 1988, the Health and Life Sciences Division published 7 assessment reports:

- Healthy Children: Investing in the Future
- Mapping Our Genes: Genome Projects -- How Big, How Fast?
- Infertility Prevention and Treatment
- The Quality of Medical Care: Information and the Consumer
- Grassroots Development: The African Development Foundation
- Medical Testing and Health Insurance
- Enhancing Agriculture in Africa: A Role for U.S. Development Assistance

The Division also prepared 3 special reports and 3 background papers:

- o Field-Testing of Engineered Organisms: Genetic and Ecological Issues
- o U.S. Investment in Biotechnology
- o Institutional Protocols for Making Decisions About Life-Sustaining Treatment
- o Identifying and Regulating Carcinogens (BP)
- o Health Case Study #38: Neonatal Intensive Care for Low Birthweight Infants: Costs and Effectiveness (BP)
- o Artificial Insemination: Practice in the United States (BP)

In addition, the Division produced 11 staff papers and testified 18 times.

Listed below are several examples of direct legislative use of the Division's work:

Biological Applications

1. In his request for an assessment of international competition in biotechnology, the Chairman of the House Committee on Science, Space, and Technology stated that the Committee "has had a long standing interest in the evolution of biotechnology and relied on the expertise within the Office of Technology Assessment to provide evaluations of emerging issues relevant to this technology."

2. OTA's New Developments in Biotechnology: Field-Testing Engineered Organisms: Genetic and Ecological Issues was the subject of hearings held May 5, 1988 by the Subcommittee on Natural Resources, Agriculture Research and Environment of the House Committee on Science, Space and Technology. OTA's expertise in this area was also called upon in 1988 by Sen. Max Baucus, and OTA provided informal comments on a draft of his bill, S. 2909, the Novel Organism Release Act. In his floor statement introducing S. 2909 on October 18, 1988, Sen. Baucus cited OTA's New Developments in Biotechnology: Public Perceptions of Biotechnology.

3. OTA's work on New Developments in Biotechnology: U.S. Investment in Biotechnology was cited by Senator Lawton Chiles, Chairman of the Senate Budget Committee, in debate on S.1966, the "Biotechnology Competitiveness Act of 1988." This bill passed the Senate 88 to 1. The OTA report was also referred to in mark-up of H.R. 4502, the "Biotechnology Science Coordination and Competitiveness Act of 1988" by Rep. James Scheuer, Chairman of the Subcommittee on Natural Resources, Agriculture Research and Environment of the House Committee on Science, Space and Technology. OTA testified during hearings on that bill held July 14, 1988. Although this bill failed to reach a full House vote in this Congress, similar versions are expected to be introduced in the next Congress. It is likely that the OTA report will be influential in the development of that legislation.

4. The findings of U.S. Investment in Biotechnology were highlighted at the Congressional Clearinghouse on the Future's day long conference on biotechnology, July 12, 1988. More than fifteen members of Congress participated in the event.

5. OTA staff for New Developments in Biotechnology: Patenting Life conducted a workshop on "Federal Regulation and Animal Patents" that was designed, in part, to provide the House Judiciary Subcommittee on Courts, Civil Liberties, and the Administration of Justice with Federal agency viewpoints regarding how animals that are patented would be regulated. To facilitate the Subcommittee's deliberations on transgenic animals, OTA staff prepared two staff papers - "Transgenic Animals" and "Federal Regulation and Animal Patents" - which were delivered in February 1988. These staff papers and OTA's previously published report on Alternatives to Animal Use in Research, Testing, and Education were instrumental in consideration of H.R. 4970, the "Transgenic Animal Patent Reform Act." As noted in the House Report (H.Rep. 100-888): "The Office of Technology Assessment (OTA) was instrumental in the Subcommittee's analysis of the factual issues. It provided the subcommittee with background materials and a copy of its earlier report on animal rights, which placed the issue of patenting animals in context. In addition, OTA conducted a workshop on the federal regulatory framework for animal biotechnology, designed solely to obtain factual information from the various federal agencies about their role in the regulation of transgenic animals."

6. OTA staff for Patenting Life were consulted by the House Small Business Committee for information and potential witnesses for a hearing on the biotechnology patent application backlog at the Patent and Trademark Office. OTA staff also provided advice on this subject to the Senate Judiciary Committee, which is gathering information for possible future hearings.

7. OTA testified at two hearings on human genome projects, drawing upon work for Mapping Our Genes - on April 27 before the Investigations and Oversight Subcommittee of the House Committee on Energy and Commerce; and on July 14 before a joint hearing of the Subcommittees on Natural Resources, and Science, Research, and Technology of the House Committee on Science, Space, and Technology. Language explicitly citing the OTA study was part of S. 1966, which passed the Senate and was referred to the floor by two House committees, but did not emerge from a third committee of referral. Language establishing a human genome advisory committee, similar to that in S. 1966, was retained in report language for the Labor/HHS appropriations bill for fiscal year 1988. The panel is expressly directed to use the OTA report in its planning. House leaders have pledged to encourage passage of a bill along the lines of S. 1966 in the 101st Congress.

8. OTA's Artificial Insemination: Practice in the United States was the subject of a press conference held by Sen. Albert Gore, Jr., August 9, 1988. Sen. Gore announced his intention to introduce a bill to establish a national data bank to store the medical and genetic histories of anonymous sperm donors. He did not, however, introduce such a bill in the 100th Congress.

9. OTA's Infertility: Medical and Social Choices was the subject of hearings held June 1, 1988 by the Subcommittee on Regulation and Business Opportunities of the House Committee on Small Business. Chairman Ron Wyden said the OTA report "makes an extraordinary contribution." He added, "We are going to look back at this period... and say that your

report really paved the way." In pursuit of its interest in consumer protection issues involving in vitro fertilization clinics, the Subcommittee used the OTA report and drew upon OTA staff expertise to undertake a survey of the 170 in vitro fertilization clinics in the United States in late 1988.

10. OTA's Infertility: Medical and Social Choices was the subject of hearings held July 14, 1988 by the Subcommittee on Human Resources and Intergovernmental Relations of the House Committee on Government Operations. The Subcommittee was set to examine an issue highlighted by the OTA report: the failure since 1980 of the Department of Health and Human Services to appoint an Ethics Advisory Board to judge ethically sensitive reproductive research. In his testimony at the hearing, the Assistant Secretary for Health preempted the Subcommittee by announcing the Department's intention to reconstitute the Ethics Advisory Board. Officials at the National Institutes of Health privately credited the OTA report with being "the two-by-four that got the Department's attention."

11. Prior to its publication, the final draft of OTA's Infertility: Medical and Social Choices was used by House and Senate conferees on omnibus veteran's health legislation on April 13, 1988. The Senate had passed S. 9 on December 4, 1987, providing services through the Veterans Administration to overcome service-connected disabilities affecting procreation. The House passed no such provision. In conference, the provision was dropped. OTA informed the debate with information on the experimental nature and the success rates of the medical technologies under consideration.

12. In his request for additional assistance in the development of institutional protocols for surrogate decisionmaking, the Ranking Minority Member of the the Senate Special Committee on Aging commended the OTA report, Life-Sustaining Technologies and the Elderly, stating that the "study makes an invaluable contribution to this critical area of concern for so many older Americans and their families." The study is being used by staff of the Committee as they draft legislation to require policies for decisions about resuscitation in nursing homes.

13. Because of expertise developed by OTA staff through continuing work on problems associated with Alzheimer's disease and other dementias, the Director of OTA was required in 1987 by P. L. 99-660 (the Omnibus Health Act), to appoint a citizens advisory panel on Alzheimer's disease to advise the Secretary of DHHS, an interagency Council on Alzheimer's Disease, and the Congress. That panel has been working on recommendations to be presented to Congress and the Department of Health and Human Services in the areas of support for biomedical research, health services research, and long-term care. As currently drafted, many of the recommendations expand upon policy options suggested in OTA's report, Losing a Million Minds: Confronting the Tragedy of Alzheimer's Disease and Other Dementias.

14. Based on Losing a Million Minds, OTA staff prepared a brief summary of Federal biomedical research expenditures for Alzheimer's disease, cancer, and heart disease; relative costs to society of these diseases; and the number of persons afflicted with them. The figures clearly show that

Alzheimer's disease research is underfunded compared to cancer and heart disease when measured by costs to society and persons afflicted. This information was used by staff of the House Special Committee on Aging in considering possible changes in NIH medical research allocations.

Food and Renewable Resources

1. In their request for an assessment of agriculture's role in water quality, the Chairman and Ranking Minority Member of the House Committee on Agriculture said that "OTA is well suited for this work, having provided guidance to the Committee and to Congress on a number of related agricultural issues," specifically: Technology, Public Policy, and the Changing Structure of American Agriculture, Integrated Renewable Resource Management for U.S. Insular Areas, Impacts of Technology on U.S. Cropland and Rangeland Productivity, Innovative Biological Technologies for Lesser Developed Countries, and Pest Management Strategies in Crop Protection.

2. The Chairman of the Subcommittee on Natural Resources, Agriculture Research, and Environment, House Committee on Science, Space, and Technology, introduced the National Biological Diversity Conservation and Environmental Research Act stating that it reflects the recommendations of OTA, in Technologies to Maintain Biological Diversity, by: 1) establishing the conservation of biological diversity as a national goal; 2) creating a National Center for Biological Diversity; 3) requiring impacts on biological diversity to be included in environmental impact statements; and 4) requiring a coordinated federal program for maintaining and restoring biological diversity in the United States.

   The House Committee on Science, Space, and Technology noted in its request letter to OTA for a study of the role of U.S. universities in providing technical assistance to Third World agriculture and natural resource management and conservation that: " The OTA report, Technologies to Maintain Biological Diversity, was extraordinarily helpful to the Committee in its work on the issue of preserving biological diversity."

3. The Chairman of the Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, said of Pesticide Residues in Food: Technologies for Detection: "[OTA] evaluated a large volume of highly technical information in a very short time frame, and they succeeded in presenting their findings and options in an exceptionally clear manner. I expect that this report will play a valuable role in deliberations on food safety legislation in the 101st Congress. In addition, I believe that the report will enhance communication on pesticide detection issues among Federal agencies, state agencies, foreign governments, private industry, and academia and serve as a catalyst for reform."

4. Testimony based on OTA's soon to be released study, Technology and Public Policy to Enhance Grain Quality in International Trade, was delivered at hearings on H.R. 4345, a bill on grain quality and the reauthorization of the Federal Grain Inspection Service (F.G.I.S.). OTA's testimony was quoted during House debate of the bill and resulted in use of OTA's finding that the objectives for grain standards, as recently amended, need not be changed and that the advisory committee to F.G.I.S. should be expanded by three, to include scientists.

5. Many options from the OTA report, Integrated Renewable Resource Management for U.S. Insular Areas, were considered and approved by the new Subcommittee on Insular and International Affairs of the House Interior and Insular Affairs Committee. Establishment of the Subcommittee, itself, was stimulated by an OTA option.

6. The House Foreign Affairs Committee and the House Select Committee on Hunger (both requesters) are using Grassroots Development: The African Development Foundation as they consider new foreign aid legislation. In particular, the committees are evaluating the 1988 legislation creating an African Development Fund as one model for new approaches to development assistance. The House Science, Space, and Technology Committee, Subcommittee on Natural Resources, Agriculture Research, and Environment is using the report to plan a series of 1989 hearings.

   Both requesting committees (the House Foreign Affairs Committee and the House Select Committee on Hunger) are using this report in their evaluation of the Foreign Assistance Act (FAA). Both committees are also using the report to prepare for ADF's reauthorization hearings next year. Mr. Wolpe, chair of the African Subcommittee, House Foreign Affairs, based his recommendations to the House Appropriations Committee regarding ADF's FY'89 appropriations on this study. OTA has assisted his staff plan a visit to Senegal, based on expertise accumulated in this work. Select Committee on Hunger staff said, about one month after release, that the report is "...very impressive in its thoroughness, fairness, accuracy and tone. The response in [the] committee was very positive." Also, the Senate and House Appropriation Committee's Foreign Operations Subcommittees used the report during their hearings on ADF and based follow-up questions on the report's findings. Approximately one-half of OTA's options were included in the final ADF appropriations legislation.

Health

1. OTA's finding that "the health of American Indians on average has improved on many measures over the past 15 years, but in almost every IHS service area and on almost every measure, it is still far behind that of the U.S. all races population" (from Indian Health Care) was quoted during floor debate on H.R. 5261, the Indian Health Care Amendments of 1988.

   OTA's April 1987 staff paper on "Current Health Status and Population Projections of Native Hawaiians Living in Hawaii," which was a followup request to OTA's 1986 assessment of Indian Health Care , provided the primary justification for the "Native Hawaiian Health Care Act of 1988," which was enacted into law this session. During the floor debate in the House, Congressman Henry Waxman (D-CA) referred to the OTA study to justify support for the bill.

2. OTA's work on the accuracy of AIDS antibody testing was cited during floor debate on legislation that would have required the Veterans' Administration to routinely offer to perform the antibody test to all VA hospital patients under the age of 40.

OTA's October 1987 testimony on the Accuracy and Reliability of AIDS Antibody Testing before the House Small Business Subcommittee on Regulation and Business Opportunities provided some of the rationale behind the Clinical Laboratory Improvement Amendments of 1988, which was enacted into law this session. The Subcommittee Chair (Ron Wyden, D-Ore.) was also the floor manager for the bill in the House, and referred to the OTA testimony (and a followup memo requested by him) during the floor debate.

Based on the study entitled How Effective Is AIDS Education?, OTA staff testified on the effectiveness of AIDS education at a hearing of the Senate Committee on Governmental Affairs, June 8, 1988. The information was subsequently used in floor debate on legislation regarding the provision of educational material by federal programs.

Throughout the year, OTA staff briefed several Senate and House staffers on issues pertaining to the HIV epidemic, including the costs of treating AIDS patients and the effectiveness of AIDS education. OTA also provided a paper reviewing the effectiveness of AIDS education among drug users to several Congressional staffers preparing material for legislation on federal funding of drug treatment programs.

3. OTA's work on polygraph testing was cited extensively in debate that led to passage of the Employer Polygraph Protection Act of 1988 (P.L. 100-347), which prohibits any employer from using any lie detector test or examination in the workplace, either for pre-employment testing or testing in the course of employment.

4. H.R. 3658 cited a 1985 OTA staff paper that estimated that smoking costs the people of the United States $43,000,000,000 in lost production and $22,000,000,000 for related diseases each year.

5. Rep. Waxman, Chairman of the Subcommittee on Health and Environment, House Committee on Energy and Commerce, announced he would be introducing legislation to implement several options in the report, Healthy Children: Investing in the Future, most notably the option to expand mandatory benefits for medicaid to all pregnant women and infants below the poverty level. Within a week of its release, both Rep. Waxman and Senator Bradley introduced legislation, referring to the OTA report in their remarks accompanying the bill. The main provisions of those bills were incorporated into the Catastrophic Health legislation, signed into law in June, 1988.

   Currently, project staff are assisting staff of the Senate Finance Committee on approaches to providing expanded benefits under Medicaid for high-risk infants, such as low birthweight babies, and for well-child care.

   The Technology Dependent Children report has been used as the basis for development of a white paper on financing of care for these children by a Congressionally mandated Task Force on Technology Dependent Children.

6. Congress included a benefit for mammography screening in the Catastrophic Health Bill (P.L. 100-360). Results of an OTA survey on acceptable reimbursement levels for mammography screening were used.

7. OTA's report, The Quality of Medical Care: Information for Consumers, was the subject of a hearing on June 6, 1988 chaired by James Scheuer before the Subcommittee on Natural Resources, Agriculture Research and Environment of the House Committee on Science, Space, and Technology. Congressmen Scheuer and his staff used the OTA report as the departure point for questioning consumer organizations, patients, federal and state officials, and physician and hospital organizations about ways of measuring the quality of physicians and hospitals and about steps that the federal government might take to improve information available for consumers.

8. Because of OTA testimony at four hearings in 1986 and 1987 before three House committees and one Senate committee on the accuracy and reliability of urine drug testing, OTA staff were frequently consulted by House Energy and Commerce Committee staff during negotiations between the House and Senate on the Anti-Drug legislation enacted into law this session. During the Senate debate, Senator Daniel Moynihan (D-NY) also requested and received an estimate of drug testing costs from OTA.

11.5 Changes in Prior Plans for FY 1988 and FY 1989 for the Health and Life Sciences Division

During Fiscal Year 1988, the Health and Life Sciences Division essentially accomplished its goals, with approved modification and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 15 for the breakdown of the differences in estimated and actual Division spending for FY 1988.)

11.6 Priorities for FY 1989 for the Health and Life Sciences Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Health and Life Sciences Division may be asked to undertake in Fiscal Years 1988 and 1989. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

12.3 Role of the Science, Information, and Natural Resources Division

The Science, Information, and Natural Resources Division comprises 3 programs: Communication and Information Technologies; Oceans and Environment; and Science, Education, and Transportation.

The Communication and Information Technologies Program is concerned with technologies that create, read, store, manipulate, transmit, or display information. Primarily these are electronic technologies exemplified by computers and communications systems. The core responsibilities of the Program require monitoring the research and development of new information technologies and assessing the technological state of the art in these areas as well as trends in basic research and development. The Program also studies telecommunications regulation, information policy, and applications of information technology in the public sector.

The Oceans and Environment Program has responsibility for all ocean-related questions, including ocean resources and maritime policy, and for large-scale environmental issues, such as climate modification and water pollution. As a result of changing Congressional interest, the Program has developed capability for analyzing the difficult questions in which the overriding concern lies with the environmental effects of decisions. The work of the Program usually falls under one of five basic categories: federal services, natural resources, pollution control, marine industry, and large-scale environmental issues.

The Science, Education, and Transportation Program is responsible for principal work in the broad areas of science policy (basic research direction and resource allocation), education (education in grade K through graduate school and programs for adults not based on job skills), and the more technology specific area of transportation. For purposes of Program development: (1) "science" includes issues surrounding the health of the scientific enterprise; (2) "education" refers to in-school and other methods, practices, and philosophy for people from early childhood through adult; and (3) "transportation" refers to all modes of transport – vehicular, rail, air, and water.

12.4 Accomplishments of the Science, Information, and Natural Resources Division

In FY 1988, the Science, Information, and Natural Resources Division published 7 assessment reports:

- Hospital Automation and the VA
- Defending Secrets, Sharing Data: New Locks and Keys for Electronic Information
- Book Preservation Technologies
- Educating Scientists and Engineers: Grade School to Grad School
- Safe Skies for Tomorrow
- Power On! New Tools for Teaching and Learning
- Gearing Up for Safety

The Division also published 3 special reports and 3 background papers:

- o Science, Technology, and the First Amendment
- o Criminal Justice, New Technologies, and the Constitution
- o Biology, Medicine, and the Bill of Rights
- o State Educational Testing Practices (BP)
- o Using Desalination Technologies for Water Treatment (BP)
- o Electronic Delivery of Public Assistance Benefits: Technology Options and Policy Issues (BP)

In addition, the Division prepared 7 staff papers and testified 15 times.

Listed below are several examples of direct legislative use of the Division's work:

Communication and Information Technologies

1. The Chairman of the Committee on House Administration commended Informing the Nation: Federal Information Dissemination in the Electronic Age as a document that provides "the Congress with an overview of problems and opportunities for information policies that will be most useful to [the Congress] as we enter this new age of technology, and begin the third century of the United States Congress."

   The Joint Committee on Printing used the OTA report in deliberations on pilot tests for the Depository Library Program and policies for GPO involvement in electronic publishing and dissemination.

   The House Committee on Appropriations cited the OTA study with respect to Depository Library Program issues addressed in the Legislative Branch Appropriations Acts of Fiscal Year 1988 and 1989.

   The House Committee on Science, Space, and Technology used the OTA study and related OTA testimony in deliberations and legislative activity on the NTIA privatization proposals.

2. The Chairman of the Subcommittee on Oversight and Government Management, Senate Committee on Governmental Affairs, introduced the Computer Matching and Privacy Protection Act in response to OTA's report, Electronic Record Systems and Individual Privacy. The Act was signed into law October 18, 1988, and reflects several OTA findings on means to maintain privacy protections: an expanded definition of computer matching; establishment of Data Integrity Boards; less agency discretion in conducting computer matching; requirement of cost-benefit analyses prior to computer matching; independent verification of data; strengthening of due process protections; and enhanced congressional oversight.

3. The Chairman of the Subcommittee on Civil and Constitutional Rights, House Committee on the Judiciary, called OTA's contribution to review of the National Crime Information Center "invaluable," stating that OTA's work (among others) allowed development "of a set of principled concerns regarding the civil liberties implications of the proposed expansions [in the system]."

4. The 1988 budget conference report quoted extensively from OTA's study, Hospital Information Systems at the Veterans' Administration, and the committees made use of several OTA findings, evident in: 1) a decision to require regular updates on any slippage or schedule changes in implementing the Decentralized Hospital Computer Plan (DHCP); 2) a decision to make funding contingent upon order entry/results reporting working satisfactorily in a high transaction environment and initiation of a suitable long-term planning process; and 3) a stated plan to incorporate OTA's long term planning recommendations, including the formal involvement of outside experts to assist in providing recommendations and evaluation of options for the next generation of automation.

Oceans and Environment

1. OTA's staff paper, "Vital Signs for Medical Waste Management," was cited by the Chairman and Ranking Minority Member of the House Committee on Science, Space, and Technology as "the best study, to date, on the problem of management of infectious hospital wastes." The Chairman of the Subcommittee on Regulation and Business Opportunities, House Committee on Small Business, made the paper the focal point of hearings on the treatment and disposal of medical wastes, stating that the paper "is particularly significant in being the first to address the national nature, scope, and cause of the emerging infectious waste problem." Both committees have requested additional work by OTA on the subject.

2. In requesting additional work on water contamination from agricultural chemicals, the Chairman and Ranking Minority Member of the House Committee on Science, Space, and Technology stated that "OTA has conducted several helpful assessments in the past on groundwater contamination issues, in particular the 1984 assessment, Protecting the Nation's Groundwater from Contamination."

3. In his request for an assessment of global climate change, the Ranking Minority Member of the Senate Committee on Environment and Public Works stated that, "The OTA analysis of possible outcomes of the Montreal Protocol was quite valuable. It contributed substantially to a better understanding of the Protocol's details and helped focus attention on the need to clarify a number of uncertainties."

   OTA's analysis of the Montreal Protocol on Substances that Deplete the Ozone Layer was printed in the Dec. 21, 1987 Congressional Record in connection with Senator's Stafford's introduction of S.1990, The Global Environmental Protection Act of 1987.

4. OTA's work on Wastes in Marine Environments was cited as instrumental in the development of legislation and a Member's decision to encourage the House Committee on Merchant Marine and Fisheries to conduct a comprehensive review of coastal pollution problems. The Chairman of that committee cited OTA's study, particularly the finding that even assuming total compliance with existing laws, degradation of estuaries and coastal waters would continue, in floor debate on the appropriate level of FY 1989 funding for EPA. H.R. 4231, the Marine Research Act of 1988, also

cited this study's finding that the overall environmental quality of the marine environment is declining or threatened.

5. S. J. Res. 394, a bill to establish a national policy on permanent papers, cites OTA's finding, from Book Preservation Technologies, that only 15 to 25 percent of the books currently being published in the United States are printed on acid free paper.

6. A bill to ban the manufacture of certain plastic guns that could pass undetected through security devices was passed by the Congress and signed into Law in October 1988. Throughout the two-year Congressional debate on this issue, the 1986 OTA staff paper dealing with the technology of plastic guns was cited in Congressional letters, hearings and reports.

7. During the debate and passage of the Anti-Drug Abuse Act of 1988, the OTA report, "Border War on Drugs," was frequently cited as the authoritative source on trends in drug trafficking and the Federal interdiction effort.

8. In June 1988, OTA published a staff paper requested by the House Appropriations Committee analyzing "Buy American" proposals for offshore oil and gas facilities. The Interior appropriations debate for FY 1989 made use of this paper in considering the pros and cons of a "Buy American" provision.

9. The section on Legislative Appropriations in the FY 1989 Appropriations Bill referred to the OTA study, "Book Preservation Technologies," and requested that the Library of Congress carry out several of the options contained in the study.

10. As we have since the 97th Congress, OTA helped the House Committee on Energy and Commerce and the Senate Committee on Environment and Public Works draft and analyze proposals to amend the Clean Air Act. OTA's analysis of the feasibility and costs of more stringent automobile emission controls was extensively used during House debates. Drawing on models and data gathered during the acid rain assessment, OTA was able to respond rapidly to the Senate's request for analyses to assist its efforts to reach a compromise on acid rain during the closing days of the 100th Congress.

Science, Education, and Transportation

1. A member of the Subcommittee on Surface Transportation, House Committee on Public Works and Transportation, stated that OTA's assessment, Transportation of Hazardous Materials, "was very helpful ... in understanding the important issues surrounding the transportation of these dangerous materials and in framing ... legislation to require the Department of Transportation to conduct a regional study of the problem." H.R. 3682 also quoted this study, stating that "OTA has concluded that 75 percent of firefighters and police in the United States are inadequately prepared to respond to a hazardous materials transportation accident.

2. During debate on the education benefits provided by S. 2011, the Veterans' Benefits and Programs Improvement Act, OTA's assessment, Safe

Skies, was cited to the effect that, "An OTA report issued in July of this year indicates that, in the next decade, about 32,000 jet pilot jobs and up to 20,000 non-jet regional airline pilot positions will need to be filled. As soon as 1992, we will likely have a shortage of over 4,000 commercial and instrumental pilots. By the year 2010, an estimated 240,000 pilot positions will need to be filled."

Public Law 100-591 contains a requirement for the Federal Aviation Administration to undertake a human factors research program and authorizes $25 million for that effort, a requirement taken directly from Safe Skies. The law was a joint effort between Mr. Mineta (House Public Works, from testimony of June 2, 1988) and Mr. Lewis (House Science, Space, and Technology, from testimony of April 8, 1988). In the Senate, Senators Ford and Kassebaum took the lead, based on testimony before the Senate Subcommittee on Aviation of the Committee on Commerce, Science, and Transportation on April 20, 1988.

3. The assessment Power On! New Tools for Teaching and Learning (including the staff paper, workshops, and OTA testimony and briefings for Committee staff) assisted in the development of several key provisions in the School Improvement Act (Public Law 100-297). These include specifying the acquisition of computer hardware, software, and related materials as one of five priority areas for use of Chapter 2 funds, and encouraging the use of technology in magnet schools programs and bilingual education programs (Reference to OTA findings p. 80 of the Committee Report, School Improvement Act of 1987, H.R. 5, Report No. 100-95, May 15, 1987).

   OTA testimony on the Computer Education Assistance Act of 1987 (S. 838), before the Senate Subcommittee on Education, Arts, and Humanities of the Committee on Labor and Human Resources (August 4, 1987) supported Federal funds for computer hardware and software acquisition, technology planning at the school level, teacher training, and educational technology R&D. These components were incorporated into provisions of the School Improvement Act and the Trade Act.

   Power On! was used and cited extensively in the Report of the House Subcommittee on Select Education of the Committee on Education and Labor on "Educational Research, Development, and Dissemination: Reclaiming a Vision of the Federal Role for the 1990's and Beyond" (draft, dated September 1988). In addition, OTA testified at the Subcommittee's hearing on September 29, 1988.

4. The elimination of the Commercial Zone Exemption was based, in part, on the briefings by the Gearing Up for Safety staff on January 11, 1988, for the Senate Committee on Commerce, Science, and Transportation, and January 20, 1988, fore the House Subcommittee on Surface Transportation of the Committee on Public Works and Transportation.

5. Rep. Doug Walgren, Chairman of the Science, Research, and Technology Subcommittee, House Science, Space, and Technology Committee, introduced a bill in the 100th Congress that would create new Congressional Awards for Science and Engineering (CASE) fellowships. Each year, one man and one woman in each of the Nation's 435 congressional districts would be awarded a 4-year fellowship ($5,000 per year) for the study of science or

engineering at a U.S. undergraduate institution of the student's choice. Mr. Walgren cited the OTA report, Grade School to Grad School, as highlighting the need for such a program; it would be administered through the National Science Foundation.

12.5. Changes in Prior Plans for FY 1988 and FY 1989 for the Science, Information, and Natural Resources Division

During Fiscal Year 1988, the Science, Information, and Natural Resources Division essentially accomplished its goals, with approved modifications and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 15 for the breakdown of the differences in estimated and actual Division spending for FY 1988.)

12.6. Priorities During FY 1989 for the Science, Information, and Natural Resources Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Science, Information, and Natural Resources Division may be asked to undertake in Fiscal Years 1988 and 1989. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Communication and Information Technologies

o Telecommunications and Rural America

Technological advances and changing market conditions are altering the United States communication infrastructure in ways that will have profound impacts on how American people live and work. A critical dimension of these changes is their effect on economic conditions in rural areas. Some analysts foresee an information age that will overcome the barrier of distance and thereby usher in a new future for rural areas. Others believe that it will perpetuate the gap between rural and urban America. This study will seek to analyze the role that new communication and information technologies will play in rural America, with particular attention being devoted to the questions: 1) Will technological advances be available in a timely manner to rural America; 2) Does information age technology involve economies of scale that will make the adoption of these technologies by rural businesses and communities cost prohibitive; what are the expected economic effects of information technologies in rural areas; which rural areas are likely to have the greatest ability to make use of these new technologies; and what role can the various

levels of government play in fostering information age technology? This study will build upon the prior study, Making Connections: A Communication Infrastructure for the Future, which will be completed by early Spring 1989.

o Integrity Testing in the Workplace

The Employee Polygraph Protection Act of 1988 prohibits, as of December 27, 1988, the use of polygraph tests for pre-employment screening in the private sector. Many anticipate that employers will increasingly substitute paper and pencil integrity tests. This study will consider the accuracy of tests currently used, such as "honesty tests" and "personality-based measures," as well as alternative means for evaluating a potential employee's integrity. In addition, the study will analyze the ethical and social implications of more widespread use of integrity testing, including whether such tests violate an employee's privacy and protection against self-incrimination, or discriminate on the basis of gender and race.

o New Communication Technologies and the Electoral Process

Effective use of computer and communication technologies is essential to political campaigns in identifying voters, tailoring messages, managing workers and schedules, writing speeches, polling citizens, and tracking opponents. Effective use of the media, especially TV news and advertising, is equally important to successful campaigns. This study would examine trends in the use of these technologies in recent Federal elections. The study would also evaluate the policy options for a number of issues, including the accuracy and validity of computerized vote-counting, the use of exit polls on election day, negative political advertising, and campaign financing.

o National Electronic Identifier

With the increased reliance on computerized record searches and online record exchanges, public and private organizations are becoming dependent on electronic identifiers, often social security numbers, for record management. As the Federal government adopts electronic delivery of benefits, such as Medicare catastrophic insurance, a unique electronic identifier becomes essential. This study would examine the trends in public and private sector use of electronic identifiers, evaluate their reliability as identifiers and authenticators, and discuss the policy implications raised by dependence on an electronic identifier.

o Information Technology and Global Problem Solving

Understanding and analysis of, and ultimately policymaking on, a wide range of global problems--from economic competitiveness to food supplies to technological collaboration to environmental crises--depend increasingly on global-scale information collection and dissemination. Electronic technologies--such as electronic bulletin boards, electronic publishing, and optical disks--provide exciting and cost-effective opportunities but also intensify the challenge of simultaneously strengthening public access, protecting privacy and national sovereignty, and facilitating international cooperation. Heightened congressional interest in many of these areas suggests that an OTA assessment could make a very timely and significant contribution.

U.S. House of Representatives
Committee on Science
Hearing On
Scientific and Technical Advice to Congress

Witness:
Congressman Rush Holt

Questions For the Record

Appendix F

Office of Technology Assessment
Justification of Estimates
Submitted to the
Subcommittee on Legislative Branch Appropriations
1991

Relevant Pages
329-334
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Office of Technology Assessment
U.S. Congress

Fiscal Year 1991
Justification of Estimates

NOT FOR DISTRIBUTION UNTIL AFTER HEARINGS ON LEGISLATIVE APPROPRIATIONS

Submitted to

Subcommittee on
Legislative Branch Appropriations

December 20, 1989

4. Overview of OTA's Role

The Berlin Wall has new doors to freedom; the Iron Curtain has been torn. Perestroika, glasnost, and solidarity are actions not images. These shifts in the political underpinnings of the East-European bloc suggest, to some theorists, the "end of history" and the beginning of an era of complacency. Without ideological conflict, they posit, we will be left with only technical problems that can be solved routinely and swiftly.

Can U.S. policy makers afford to be as sanguine, when changes in Eastern and Western Europe also create change in U.S. world position? One lesson we have surely learned in the past 2-4 decades is that the pace of technical change itself can create great social upheaval as well as great progress toward many social goals. Each technical solution to one problem also generates a new set of issues to be resolved. In other words, there's no free lunch. Advances in biotechnology, for instance, gave us marketable bovine growth hormone, but that, in turn, gave us consumer wariness and major impacts on the dairy industry. Congress is inescapably drawn into the process of developing a strategy to encourage innovation and maintain our competitive position while avoiding the possibility that we unfairly displace farmers or alarm consumers.

Triumphs in genetics, superconductors, and communications are not isolated events. The mix of new technologies creates an array of interlocking problems, thereby requiring a broader approach to problem-solving and policy-making. To assist Congress in its deliberations on emerging and existing technologies, OTA provides the necessary arena for experts and stakeholders to lay out their differences and identify areas of consensus. OTA works with committees to help Congress understand the potential impacts of technologies and form decisions that reflect both local and global concerns.

The bipartisan, bicameral Technology Assessment Board -- a critical element in OTA's reputation for objectivity and relevance -- has approved studies for the coming year that consider the interdependent consequences of technological development: from energy supply and demand in developing countries (and how this affects both economic development and climate change), to monitoring compliance with possible arms control measures; from promoting technology development and managing trade in Europe and the Far East, to identifying the real costs of pharmaceutical drug research and development; from bridging the gap between rural and urban America through information technologies, to the hazards of medical wastes. OTA's studies generally reflect the range of Committee interests -- on both sides of the aisle and both sides of the Hill. OTA thus serves as a small, highly skilled, shared resource for all of Congress . . . a unique way to maximize technical assistance at minimum cost.

5. OTA's Accomplishments During Fiscal Year 1989

During FY 1989, OTA delivered 26 formal publications to Congress, including assessment reports, an interim summary, special reports, a technical memorandum, and several background papers. (See pages 83-91.) As of September 30, 1989, 37 Technology Assessment Board (TAB) approved studies were in progress and 7 were in press or under TAB review. As an integral part of carrying out assessments, OTA also provided, during the course of projects as well as after delivery, expert advice, briefings, testimony, and results of OTA assessments to Committees matched to their specific needs and the Congressional agenda. (See pages 132-136.)

OTA reports represent comprehensive synthesis and analysis on some of the most controversial and costly issues faced by Congress . . . covering, for example, hazardous waste reduction and management, international trade and technology transfer, the future of American agriculture, the technology for defensive weapons, health care cost containment and the future of biotechnology. These studies directly reflect the expressed needs and

priorities of Committees of House and Senate. **During the year, OTA served over 80 different Committees and Subcommittees of both houses, typically in response to bipartisan requests.**

Relation of Work to Legislative Activities

OTA's role is neither to promote nor to discourage the development or the application of any particular technology or legislation but rather to help Congress determine whether or when some form of Federal government participation may make sense. OTA helps identify and clarify options; exposes misleading, unsupportable, or incorrect information; and helps raise the level of understanding in the debate about expensive and controversial technical issues.

In each section on accomplishments in OTA's divisions, we identify some activities during fiscal years 1989 and 1990 that illustrate the link between OTA's work and specific Congressional activity. Please see the following pages for this information:

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Energy, Materials, and International Security Division
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- Industry, Technology, and Employment 35
- International Security and Commerce 36

Health and Life Sciences Division
- Biological Applications 47
- Food and Renewable Resources 48
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Science, Information, and Natural Resources Division
- Communication and Information Technologies 62
- Oceans and Environment 62
- Science, Education, and Transportation 64

Mandate Avoidance

OTA works closely with members of TAB and the Appropriations Committees to maintain the authority of the Board to determine the agenda of the agency and the best use of OTA's limited resources for the whole Congress. Because demand for OTA assistance exceeds the resources made available to the agency, some committees attempt to initiate studies through new legislation rather than request studies through the Board (as was contemplated in OTA's enabling legislation). Mandates are strongly discouraged as a mechanism to obtain OTA's help, and potential mandates are often avoided when we are able to work with the interested parties prior to introduction of bills. Nevertheless, during the first session of the 101st Congress, a number of bills were introduced that would, if passed, mandate activities for OTA. For example:

H.R. 7 — Last action: reported out of Senate committee November 1. Would require OTA to evaluate (for validity, fairness, accuracy, and utility) a demonstration program to monitor educational outcomes for applied technology education using wage and other records. Would also require OTA to conduct an assessment of a sample of tests designed to be administered to students who have completed secondary school to assess the level of technical knowledge relating to broad technical fields possessed by such students. The study would be due to Congress not later than September 30, 1994.

H.R. 99 — Last action: hearings held May 24.
Would require the EPA Administrator to consult with OTA in designing a study of the feasibility of meeting standards in-use [vehicle emissions].

H.R. 370 — Last action: hearings held July 13.
Would direct the Office of Technology Assessment to conduct a study of the effects of the reclassification of anhydrous ammonia as a poisonous gas and transmit a report to Congress within 18 months of enactment.

H.R. 1078 — Last action: referred to subcommittee May 1.
Would require OTA, within 2 years of enactment, to report to Congress on OTA's review of forestry projects and programs in tropical countries financed by the Agency for International Development and the extent to which these projects promote agroforestry and reforestation which discourages monoculture estates and which involve local people in the design, implementation, and monitoring of projects.

H.R. 1240 — Last action: referred to subcommittee March 13.
Would require OTA, within 3 years of enactment, to conduct an evaluation of the performance of the Agency for International Development in carrying out this Act and report the result of the evaluation to Congress. [AID is directed to facilitate equitable economic growth and participatory development, national and regional economic integration, environmental sustainability, food security, and self reliance in the Caribbean through responsive aid and development policies and programs.]

H.R. 1746 — Last action: Additional sponsors added October 16, 1989
Would require OTA to conduct a study of: 1) all incentives under law for the protection and management of wetlands; 2) modifications to law that might improve their effectiveness; and 3) ways the federal government could encourage State and local incentives for wetlands protections. The report would be due one year from enactment.

H.R. 2076 — Last action: referred to committee April 25.
Would require OTA to determine whether manufacturers are likely to comply with the average fuel economy standards without incentives, and if incentives are thought to be required, to suggest cost-effective incentives. The report would be due to the President and each House of Congress within 18 months of enactment.

H.R. 2091 — Last action: referred to committee April 27.
Would amend title XVIII of the Social Security Act to require an annual report from the Director of the Congressional Office of Technology Assessment on changes in payment amounts for certain surgical transplantation procedures. The first report would be due one year after the date of enactment.

H.R. 2263 — Last action: referred to subcommittee May 11.
Would require the Director of OTA to appoint the 13 members of a new Long-Term Care Advisory Council within one month of enactment.

H.R. 2655 Last action: received in the Senate July 11.
Would require OTA to conduct an evaluation of the performance of the agency administering the Foreign Assistance Act within 3 years of enactment.

H.R. 2980 Last action: referred to subcommittee July 31.
Would require the Director of OTA to appoint the 9 members of a new National Council on Quality Assurance (the Director could increase membership under certain conditions). OTA would be required to issue an annual report on the Council's progress.

H.R. 3150 Last action: referred to committee August 4.
Would require OTA to conduct at study to determine the costs associated with various modalities of dialysis treatments provided to end stage renal disease patients and make recommendations regarding the level at which the composite rate used to determine the amounts of payments made should be established. This study would be delivered not later than June 1, 1990.
Would also require OTA, by July 1, 1990, to submit a report on alternative acquisition and reimbursement strategies for reducing expenditures for certain drugs used to treat end stage renal disease patients in a manner that does not adversely affect the quality of care provided to such patients.

H.R. 3299 Last action: conference held October 25.
Would require the Director of OTA to conduct a study of the appropriateness of medicare reimbursement for experimental cancer treatment under research protocols, including an analysis of the costs to the medicare program of such reimbursement, whether such reimbursement should be limited to cancer center hospitals, and any controls the program should place on such reimbursement. The report would be due to the Committee on Ways and Means in the House and the Committee on Finance in the Senate on June 1, 1992.

S. 933 Last action: (House bill) printed as it passed Senate October 16.
Would require OTA to undertake a study of the access needs of individuals with disabilities to over-the-road buses. The bill prescribes the types of advisers to be appointed to guide the study and sets a deadline for completion of 3 years from enactment.

S. 1036 Last action: referred to House committee September 26.
Would require OTA to include, in a study of the effects of information age technology on rural America, an analysis of the feasibility of ensuring that rural citizens in their homes and schools have the ability to acquire, by computer, information in a national library.

S. 1153 Last action: referred to House committee August 4.
Would require the Secretary of Veterans' Affairs to consult with OTA before compiling or analyzing any information; would require OTA to review all annual reports before they are submitted to Congress; and in the event NAS is unwilling to cooperate, would require OTA to consult on the issue of the establishment and maintenance of a tissue archiving system.

S. 1237 — Last action: hearings held July 18.
Would require the Director of OTA to serve on an interagency council to encourage the use and development of agricultural commodity-based plastics.

S. 1442 — Last action: referred to subcommittee September 13.
Would establish a Congressional Council on Education and Space and make the Director of OTA an ex-officio member of the Council. The bill also states that to the maximum extent practicable, the Council shall be located in the facilities of OTA.

S. 1578 — Last action: referred to subcommittee August 5.
Makes a representative appointed by the Director of OTA a member of the Board of Trustees for the National Center for Preservation Technology.

S. 1593 — Last action: referred to committee September 12.
Encourages OTA (among others) to assist the newly established National Commission on Natural Resources Disasters with personnel and support services without reimbursement.

OTA works closely with many committees to fulfill their requests for information through accepted channels. Efforts to avoid mandates may become more difficult as OTA's budget becomes tighter and the agency is forced to refuse or curtail a greater number of requests, even when made through proper channels.

Mandated Activities

Despite efforts to avoid mandates, over the past several years OTA has undertaken several projects as a result of legislative mandates. Our ongoing activity, Monitoring of Mandated Veteran Studies (mandated by P.L. 96-151) is the longest-lived piece of "legislated" work. OTA's initial work in this area led to additional mandates: P.L. 98-160 requires that OTA monitor certain federal research activities with regard to veterans exposed to atomic radiation; P.L. 99-272 requires that OTA monitor certain federal research activities with regard to women veterans.

In recent years, there have been mandates for full assessments. In FY 1986, OTA delivered an assessment, Payment for Physician Services, mandated by P.L. 98-369. OTA's assessment of the Strategic Defense Initiative was mandated by P.L. 99-190; a classified version of this report was delivered to appropriate committees in September 1987 (an unclassified version was released in June 1988).

The 100th Congress produced legislation that required special analytical responses from OTA. **P.L. 100-180** required OTA's participation in a Conventional Defense Study Group that assessed the balance of conventional forces in Europe between the forces and NATO and the forces of the Warsaw Pact. The Comptroller General, leader of the study group, requested OTA to convene a workshop on Soviet views of the conventional balance in Europe.

P.L. 100-435, enacted during the second session of the 100th Congress, requires OTA to develop model performance standards, and review those actually developed by the Secretary of Agriculture, with regard to employment and training requirements within the food stamps program. A report to the Speaker, the President Pro Tempore, and the Secretary of Agriculture on the comparison/review is required.

OTA has also been assigned the task of appointing health-related commissions. P.L. 99-660 mandated the OTA Director to appoint a citizens' Advisory Panel on Alzheimer's Disease. This mandate does not include any reporting requirements for OTA. However, OTA is required to appoint and monitor the activities of three additional commissions (see below).

Prospective Payment Assessment Commission (ProPAC)

The Commission is an independent advisory committee mandated under the "Social Security Amendments of 1983" (Public Law 98-21, Section 601) that reform the Medicare program payment method.

Under the Statute, the OTA Director is charged with selecting the Commission members. The first Commissioners were appointed in 1983. Six Commissioners' terms expired in March 1989, and the Director made two reappointments and four new appointments.

OTA is also required to report to Congress annually on the functioning and progress of the Commission. The fourth of these reports was issued in November 1988.

Physician Payment Review Commission (PhysPRC)

The Physician Payment Review Commission is also an independent advisory committee mandated under the Consolidated Omnibus Budget Reconciliation Act of 1985 (P.L. 99-272). PhysPRC's purpose is to advise Congress and the Executive Branch on possible ways of reforming physician payment under the Medicare program.

As with ProPAC, the OTA Director is statutorily charged with selecting the Commission members. Initial appointments to the 13-member Commission were made in 1986, for terms ranging from one to three years. In April of 1989, the Director reappointed three Commissioners and appointed two new Commissioners. An annual report is also required on PhysPRC, and the second of these reports was issued in November 1988.

Prescription Drug Payment Review Commission (PDPRC)

The Prescription Drug Payment Review Commission (PDPRC) was another independent advisory committee mandated under the Medicare Catastrophic Coverage Act of 1988 (P.L. 100-360). The Commission was mandated to report to Congress by May 1 of each year, beginning in 1990, concerning methods of determining payment for outpatient drugs covered under the new law.

As with the other commissions, the Director of OTA was charged with selecting the initial Commission members and making replacement appointments each year. The initial selections were made in December 1988. The Act included a requirement for OTA to report annually to the Congress on the functioning and progress of the Commission. With repeal of the Medicare Catastrophic Coverage Act, it is unlikely that any further work regarding the Commission will be required of OTA.

Interagency Coordination

In carrying out OTA's mission as a shared resource to the committees of the Congress, our staff cooperate and interact extensively not only with congressional Members and staff, but also with staffs of other federal agencies, as well as with the private sector and universities around the world. This extensive networking not only serves to avoid duplication but also helps to increase Congress' analytical resource base and enables OTA to utilize the most up-to-date information available. As a consequence, a typical OTA

assessment, costing $500,000, draws heavily upon the work of others that, taken together, would cost many times more.

Over the past several years, OTA and the three other Congressional support agencies have adopted a process to more fully utilize each other's expertise. This is as true in administrative areas as program areas; for instance, the Library of Congress provides accounting and disbursing services to OTA on a reimbursable basis, CRS provides access to the SCORPIO database and other research assistance, and GAO provides legal advice and opinions. The Comptroller General and the Director of CRS serve on OTA's Technology Assessment Advisory Council, and agency directors meet regularly to discuss issues of common concern. CBO, CRS, and GAO staffs coordinate with, and, in some cases, participate in OTA advisory panel meetings, symposia, and workshops. The four agencies share information on related studies and provide new data as input to each others' projects as appropriate to their areas of expertise. In addition, two or more agencies may collaborate in the preparation of testimony or general assistance for Congressional hearings. Examples from 1989 include:

- OTA has shared the results of its work on alternative transportation fuels with staff of CRS's Environment and Natural Resource Policy Division, and helped to review CRS's work on methanol costs.
- OTA staff have met frequently with GAO staff in the course of preparing a staff paper on Technologies for Improving Minerals Royalty Management. GAO will continue with this work after OTA has delivered it's report to the Senate Energy and Natural Resources Committee.
- OTA and the Semiconductor Industry Association organized a colloquium for CRS, CBO, GAO and OTA staff working on issues of semiconductor trade and technology. Approximately 50 staff attended.
- OTA, CRS, GAO, and CBO hold bimonthly coordination meetings on trade issues. These are small informal meetings, attended by one or two people from each agency. Information, drafts of work, and other material are exchanged, and substantive discussions of trade issues held.
- OTA, CRS, and GAO have established an informal working relationship on worker training issues, involving periodic meetings, sharing of information, and attendance at each other's panel meetings and workshops.
- ISC participated in a four agency project (under the direction of the GAO) established by the FY88-89 National Defense Authorization Act to report to the Congress on the conventional force balance in Europe. This resulted in the Report "NATO-WARSAW PACT Assessment of the Conventional Force Balance" GAO/NSIAD-89-23.
- CRS staff served as analysts for OTA's assessment, Holding the Edge. The report has also been used by CRS as an input to several seminars on the defense technology base.
- CRS staff are contributing to the assessment of International Cooperation in Defense Technology.
- At the request of the House Government Operations Committee staff, OTA briefed GAO staff as the latter began a study of "brilliant pebbles."
- OTA briefed CBO staff on aspects of arms control verification.
- OTA staff are assisting GAO in planning for their new group on Resources, Community, and Economics in the Division of Information Services.
- CRS has loaned a senior staff member to OTA who will direct OTA's project on Renewable Resource Planning Technologies for Public Land Use.
- OTA and sister agency staff who are studying the economic issues relating to pharmaceuticals are meeting on a regular basis to share information and avoid duplication. The studies represented include OTA's study of Medicare drug payment alternatives, OTA's study of drug R&D costs, and GAO's study of trends in drug pricing.
- OTA hosted an Interagency Coordination Meetings on AIDS on March 21, 1989.

- GAO used OTA's Staff Paper, How Effective Is AIDS Education?, as background for its report AIDS Education: Reaching Populations at Higher Risk, prepared for the Senate Committee on Governmental Affairs.
- CRS cited extensively the data from OTA's Staff Paper, AIDS and Health Insurance - An OTA Survey in two CRS reports (Insuring the Uninsured: Options and Analysis, October 1988 and Health Insurance and the Uninsured: Background Data and Analysis, May 1988) prepared for the Subcommittee on Labor-Management Relations and the Subcommittee on Labor Standards of the House Committee on Education and Labor, the Subcommittee on Health and the Environment of the House Committee on Energy and Commerce, and the Senate Special Committee on Aging.
- As part of CRS and OTA's coordination activities in the health insurance area, CRS facilitated OTA's obtaining, at no cost, copies of Census Bureau Current Population Survey tapes.
- CBO consulted with OTA on methods for and sources of information on costing out bills proposing coverage for preventive vision and hearing services under Medicare. CBO stated that they have found OTA's reports from the Preventive Services under Medicare project extremely helpful.
- GAO and OTA held meetings to coordinate their activities regarding prescription drug pricing policies. Both agencies were mandated or requested to do several activities regarding prescription drugs and the coordination meeting and continuing discussions are designed to avoid not only duplication of effort but also to share information that could be used as data for the other studies.
- OTA and GAO staff coordinated their activities concerning the Department of Veterans Affairs' study of VA hospital mortality rates. OTA drew on prior work of GAO's Policy Evaluation and Methodology Division in OTA's critique of the methodology used by DVA to analyze hospital mortality rates, and OTA used materials PEMD had prepared in the course of GAO's two studies evaluating VA and HCFA methodologies. OTA also coordinated its critique with GAO's Human Resources Division, which was requested to do a related but field-oriented investigation of management activities at the DVA related to that department's mortality study.
- The publication of OTA's report, Informing the Nation, in October 1988 marked the successful conclusion of a major collaborative effort between OTA and GAO. GAO conducted several surveys of the information practices and needs of Federal agencies and information users. The results of these surveys were included in the OTA report; GAO separately published the full survey results.
- OTA consults on a regular basis with CRS staff on municipal solid waste issues. In particular, OTA and CRS exchanged information on market for old newsprint and revenues from potential packaging fees and discussed draft legislation on several occasions. OTA also provided information, contacts and reviews for two GAO studies, one on procurement of recycled paper products and the other on degradable plastics.
- OTA held an overall coordination meeting with all of our sister agencies on the issues of defense nuclear waste, and we continue to maintain contact with those working on the issue.
- Shortly after introduction of the Administration's Clean Air bill, OTA met with CBO, CRS and EPA to consider how each would do analyses of the acid rain and ozone provisions of this and other bills. On two different occasions this year, CBO has used OTA's data and modelling results.
- CRS provided direct staff support for OTA's analyses of a proposed new Antarctic project. One of their specialists joined the study team and prepared a chapter for the final report. This same staffer is working on another OTA project dealing with oil spill clean-up technoiogy.
- GAO has completed a study on medical waste management at Federal facilities and is finishing a study of state programs for medical waste management. However, it has been arranged that GAO will defer to OTA on the technical aspects of the problem. OTA confers regularly with EPA staff, especially at Cincinnati and Research Triangle Park labs, and with a number of state agencies.

- OTA is in regular contact with several groups in the sister agencies conducting work on various aspects of global warming--primarily CRS (studies on energy efficiency, and ways to reduce CO_2 by 20%) and CBO (effects of various carbon taxes on U. S. energy use and CO_2 emissions).

OTA also seeks to coordinate its studies with those ongoing in the Executive branch, State and local government, and in private sector and international organizations. In addition, it is not uncommon for OTA reports to have a direct impact on activities outside the Legislative Branch. For instance:

- The Federal Energy Regulatory Commission (FERC), in its recently issued Transmission Task Force Report, refers frequently to OTA's assessment report, Electric Power Wheeling and Dealing: Technological Consideration for Increasing Competition, and background paper, Biological Effects of Power Frequency Electric and Magnetic Fields.
- In the course of OTA's assessment of High Temperature Superconductors: Research, Development and Commercialization, OTA and the National Science Foundation cooperated in the preparation of a national survey of U.S. firms involved in high temperature superconductivity research and development. OTA also cooperated with the Japanese International Superconductivity Technology Center in preparing a similar survey of Japanese firms.
- OTA's work on automobile fuel economy, on alternative transportation fuels, and on energy system vulnerability has benefited from a close and cooperative relationship with the Department of Energy.
- In connection with EPA's 90-day Review of the Superfund program, OTA met several times with the agency person in charge and the taskforce conducting the study. EPA briefed OTA on the conclusions of the Review prior to its release, and later on the implementation plan that followed.
- OTA staff took part in inter-agency deliberations on U.S.-Japan cooperation in superconductivity research, as called for in the new bilateral science and technology agreement between the two countries.
- OTA participated in task force meetings of the Defense Manufacturing Board of the Department of Defense, assisting it in tackling questions of how to identify critical industries and critical technologies.
- OTA, in partial fulfillment of its mandate under the Hunger Prevention Act of 1988, has been participating on the Panel of Consultants for the Development of Employment and Training Performance Standards for the Food and Nutrition Service of the Department of Agriculture.
- OTA has been hosting the meetings of the Ad Hoc HDTV Group, an informal association of people from industry, academia and government. At the September meeting, the Hon. George Brown praised OTA's HDTV Primer (currently in preparation).
- OTA's Worker Training staff has been in close communication with key executive branch officials in the Department of Labor, the Department of Education, and the Department of Commerce. At the invitation of Labor and Education Department officials, OTA staff served as panelists at an OECD conference on international training in the services industry and at the first national conference on workplace literacy. OTA staff participated in the 1989 Federal Roundtable on Training (it's a day-long meeting involving some 50 Federal employees or contractors). The project staff has been coordinating closely with the Department of Labor's Business-Labor-Academic Commission on Workforce Quality and Labor Market Efficiency over the past 18 months. The project has also worked closely with the Department of Education-funded National Assessment of Vocational Education.

- OTA has been participating in the Interagency Technology Working Group. This group meets informally every 4 to 6 months to help coordinate research on industry resource and competitiveness issues. Other participants in the group include researchers from the Bureau of Census, National Institute of Standards and Technology, Department of Labor, National Science Foundation and Defense Logistics Agency.
- The National Defense University uses OTA reports -- Holding the Edge, The Defense Technology Base: Introduction and Overview, and New Technology For NATO -- as textbooks. Holding the Edge has also been used extensively within DoD in deliberations regarding strategic planning of technology base programs and laboratory management.
- OTA's reports on space transportation have been used extensively by NASA and the Air Force.
- An OTA staff paper on DOE weapons facilities modernization was widely distributed within DOD in the course of their internal review.
- Based on a review copy of OTA's forthcoming report Confused Minds, Burdened Families: Finding Help for People With Alzheimer's and Other Dementias, the Administration on Aging developed a research initiative on connecting ethnic minority people with dementia to health care and other services.
- OTA staff interacted extensively with the Agency for International Development (A.I.D.) on matters relating to the OTA study U.S. Universities and Development Assistance: Technical Support for Agriculture, Natural Resources, and Environment. Added support for OTA's assessment came from the Bureau of Science and Technology and A.I.D.'s Board for International Food and Agriculture Development.
- OTA staff assisted the National Governor's Association in development of their assessment of agriculturally-related groundwater contamination
- With the cooperation and assistance of approximately 40 Federal agencies, OTA has collected information on organizational structure, establishment of roles, and allocation of resources to water quality within the Federal government for the on-going OTA assessment of Agricultural Approach to Reduce Agrichemical Contamination of Groundwater.
- Through a cooperative agreement between the governments of the Freely Associated States in Micronesia, the U.S. Corps of Engineers, and the National Oceanic and Atmospheric Administration, a "Pacific Island Network" has been established to link the islands together and with Federal information and assistance efforts. Designated agents have been created in Pohnpei, Kosrae, and the Northern Marianas as of July, 1989, and agents will be selected for the other major islands by 1990. Agents will serve as active extension agents (covering aquaculture, marine resource management, protected areas) and program coordinators. Such actions were suggested in an option in OTA's assessment Integrated Renewable Resource Management for U.S. Insular Areas (1987).
- Findings from OTA's report Enhancing the Quality of U.S. Grain for International Trade are being used by the Federal Grain Inspection Service of U.S.D.A. to change standards and grades of grain and inspection procedures of the agency. The assessment is the major focus of an intra-agency task force in U.S.D.A. that is charged with providing to the Secretary of Agriculture recommendations on actions that U.S.D.A. can take to enhance grain quality. The Agriculture Stabilization and Conservation Service is using the study's findings to reevaluate their premium and discount pricing program for all major grains and the agency's storage practices.
- The National Center for Health Services Research and Health Care Technology Assessment (NCHSR) used OTA's study, Medlars and Health Information Policy, as the basis of its evaluation of a bill requiring an agreement between the proposed new agency and NLM for indexing and making available on-line the literature on health services research and technology assessment.
- In developing recommendations for the use of pneumococcal vaccine, the Center for Disease Control's Immunization Practices Advisory Committee drew on OTA's update of the vaccine's cost effectiveness, Update of Federal Activities Regarding the Use of Pneumococcal Vaccine.

- The National Academy of Sciences' Institute of Medicine is using information, including a number of charts, from OTA's report, The Quality of Medical Care: Information for Consumers, in its report on a similar subject.
- OTA was asked to testify two times before the Presidential Commission on the Human Immunodeficiency Virus Epidemic, once on the Costs of AIDS and the HIV Epidemic, and once on Laboratory Quality Control and Regulation.
- OTA is working closely with the National Science Foundation and other interested agencies in its study of high performance computing and networking for science. One senior NSF staff member is on part-time detail to the project, and OTA will be engaging in some joint workshop activities with an executive office coordinating group that operates through OSTP.
- The Federal Publishers Committee, an interagency group, used OTA's report, Informing the Nation, to set the framework for its recommendations on improving agency-GPO working relationships.
- OTA received analyses from a number of Executive Branch agencies for its work on municipal solid waste. These include the Department of Energy (Biofuels and Municipal Waste Technology Division), Department of Commerce (International Trade Administration, National Institute of Standards and Technology), and the Environmental Protection Administration. In working with EPA, there were numerous information exchanges, briefings and reviews.
- The National Academy of Sciences has formed a committee to examine the issue of constructing double bottoms in oil tankers in the aftermath of the Alaskan oil spill. NAS is using past OTA work on this subject as the basis to define the issues that need to be reviewed, and is maintaining continuing liaison with us on this subject.
- The OTA study on global warming relies extensively on the global data base collected by EPA.
- The Texas State Board of Education used OTA's report, Power On!, as the basis for five elements of their action plan. The Washington State Office of Public Instruction's Educational Technology Reports to the Legislature draw extensively on OTA's work, as do plans and actions in California, Connecticut, Florida, and New York.
- The OTA special report, Safer Skies With TCAS, was used by the Federal Aviation Administration to structure its operational evaluation program for the early phase of TCAS implementation.
- The National Education Association's Special Task Force on Technology based their recommendations for teacher training and support on OTA's work. The NEA report and press release quoted OTA frequently, and NEA's goal of "a computer on every teacher's desk by 1991" is the direct result of OTA's assessment, Power On!. IBM also cited findings from this report to justify their $25 million effort to assist in training new teachers to use technology.
- The Office of Motor Carriers in the Federal Highway Administration has used the report, Gearing Up for Safety, as an aid in structuring their human factors research.

6. Changes in OTA's Prior Plans for FY 1989

During Fiscal Year 1989, OTA essentially accomplished its goals, with approved modifications, negotiated reductions, and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to make adjustments, and also the fact that the agency must operate with fewer resources.

10.3. Role of the Energy, Materials, and International Security Division

The Energy, Materials, and International Security Division comprises three Programs: Energy and Materials; Industry, Technology, and Employment; and International Security and Commerce.

The Energy and Materials Program is responsible for assisting the Congress in understanding the technological possibilities for developing our energy and materials resources and the consequences of these developments for society. In this way, the Program can help the Congress ensure rational resource development such that economic growth is maintained, undesirable side effects are kept to a minimum, and the resource base is sustained for future generations. The Program covers those technologies that concern the extraction, delivery, and use of energy and materials. Although primarily directed at domestic resources, the Program also is concerned with world markets and policies, including imports and exports of energy and materials.

The Industry, Technology, and Employment Program examines how technology affects the ability of U.S. industry to contribute to a healthy national economy. Its responsibilities include consideration of the competitiveness of U.S. industries in international markets, trade and economic development issues, the number and nature of employment opportunities, needs for worker education, training and retraining, and ways to ease adjustment in structural economic transitions. A Program with a specific employment focus is new at OTA (the Program was established in 1983), although most assessments have considered employment impacts, and employment and training issues have been of central importance in several studies. ITE's employment concerns center on the quantity, nature, and quality of jobs, the nature of and changes in job skills, and training and retraining across the work force.

The International Security and Commerce Program deals with national security, space technology, international relations generally, and international technology transfers. The Program's work in national security involves determination of what is technologically possible followed by an assessment of the likely impacts of these technological considerations on national security, which includes international stability, diplomacy, alliance relations, and arms control, as well as deterrence and defense. The work on space technology involves a range of issues, such as space transportation, international cooperation and competition in civilian space activities, and newsgathering from space, in which technological progress, civilian exploration, commercial uses of space, and national security must be reconciled. ISC's work in technology transfer combines several perspectives: the national security and foreign policy considerations that lie behind export controls, a concern for the health and competitiveness of U.S. industry in international markets; and a concern for the objective of managing technology transfer in such a way as to contribute to favorable international economic development.

10.4. Accomplishments of the Energy, Materials, and International Security Division

In FY 1989, the Energy, Materials, and International Security Division published 3 assessment reports:

- Holding the Edge: Maintaining the Defense Technology Base
- Electric Power Wheeling and Dealing: Technological Considerations for Increasing Competition
- Oil Production Technologies and the Arctic National Wildlife Refuge

The Division also produced 1 special report and 5 background papers:

- Round Trip to Orbit: Alternatives for Human Spaceflight (Special Report)
- Assessing Contractor Use in Superfund
- Big Dumb Boosters: A Low Cost Transportation Option?

- Technology Transfer to the United States: The MIT-Japan Science and Technology Program
- Biological Effects of Power Frequency Electric and Magnetic Fields
- Statistical Needs for a Changing U.S. Economy

In addition, the Division testified 12 times and prepared 3 staff papers.

Listed below are several examples of direct legislative use of the Division's work:

Energy and Materials

1. In Senator Metzenbaum's floor statement introducing S. 984, a bill amending the Motor Information and Cost Savings Act, he stated that "studies by the Department of Energy and the Office of Technology Assessment determined that a CAFE (Corporate Average Fuel Economy standard) of 33 to 35 miles per gallon by 1995 would be practical and cost-effective and doesn't require a shift in size mix or performance." The bill itself states that, "analyses by the Department of Energy and the Office of Technology Assessment indicate that known, cost-effective technologies already in use in automobiles today could, if implemented to a greater extent in the new car fleet, provide substantial improvement in new car fuel economy without requiring shifts in the size mix, performance, or luxury equipment of new cars." This work, an interim product of OTA's ongoing assessment of Technological Risks and Opportunities for Future U.S. Energy Supply and Demand, was also cited in S. 1224, the Motor Vehicle Fuel Efficiency Act of 1989.

Throughout the year, OTA staff briefed Senate and House members and staff on alternative fuels and automotive fuel economy and other energy technology issues being addressed in the assessment and testified five times on these subjects in the last year. Several of OTA options have provided middle ground in the debate over CAFE standards.

2. Senator Bingaman used the OTA report, Statistical Needs for a Changing U.S. Economy, as part of his rationale in his floor statement introducing S. 1742 Reauthorizing the Paperwork Reduction Act.

3. The findings of OTA's report, The Arctic National Wildlife Refuge (ANWR): The Technology and the Alaskan Oil Context, were referred to frequently in the House and Senate Committee debates over proposed legislation to develop the ANWR's oil resources (H.R. 49, S. 406, S. 684, and H.R. 1600) and to designate the ANWR a wilderness area precluding such development (H.R. 39 and S. 39)

4. OTA's report, Electric Power Wheeling and Dealing: Technological Considerations for Increasing Competition, is cited frequently in ongoing legislative discussions and hearings in the House Energy and Commerce Subcommittee on Energy and Power affecting the regulation of electric utilities such as proposals to amend the Public Utility Holding Company Act, the Public Utilities Regulatory Policy Act, and the Federal Power Act.

5. OTA's reports, New Electric Power Technologies: Problems and Prospects for the 1990s, Nuclear Power in an Age of Uncertainty, and Starpower: The U.S. and International Quest for Fusion Energy, continue to be used widely by energy R&D authorizing committees as a reference source. In particular, there were referred to frequently in the House Committee on Science and Technology's Subcommittee on Energy Research and Development's authorization hearing on the DOE R&D budget.

6. S. 1578, introduced by Senator Fowler, calls for a national center for preservation technology, an option suggested in OTA's Technologies for Prehistoric and Historic

Preservation. The 1990 appropriations bill for the Interior Department included a provision directing fund be spent by the National Park Service to encourage technology transfer to preservation efforts.

Industry, Technology, and Employment

1. OTA's assessment, Commercializing High Temperature Superconductivity, was one of two major policy studies cited by the House Science, Space and Technology Committee in its report (House Report 100-900) on the McCurdy-Ritter bill (Public Law 100-697, the National Superconductivity and Competitiveness Act of 1988, which became law on November 19, 1988). This act directs OSTP, in conjunction with the National Critical Materials Council, to establish a 5-year national action plan on superconductivity R&D. In reporting its bill to the full House, the committee noted OTA's analysis indicating that while U.S. government had moved aggressively to fund basic research on superconductivity, Japan had been more aggressive in establishing a national program, as well as OTA's findings concerning the relative commitments of U.S. and Japanese firms to commercialization. These latter findings were also cited during the House floor debate on the bill.

Subsequently, this report was extensively used by OSTP in formulating their 5-year action plan, as mandated in the McCurdy-Ritter bill. OSTP also conferred a number of times with ITE staff. Indeed, the action plan, the report of the Committee to Advise the President on High Temperature Superconductivity (popularly known as the Wise Men's report), and the creation of the National Commission on Superconductivity were all influenced by the OTA report, in particular through their common emphasis on taking a long-term view, designing stability into the research and development program, working closely with industry, and supporting R&D consortia.

2. In another instance of OTA's impact on policy making and legislative drafting in the Executive Branch, the Department of Commerce recently confirmed the point made strongly in OTA's Special Report, Trade in Services: Exports and Foreign Revenues, that the positive contribution of services trade to our balance of payments has been greatly underestimated. In both Trade in Services and International Competition in Services, OTA made a strong case for a new benchmark survey of the kind recently completed. OTA also presented a strong technical rationale for the survey in coordination meetings with the Office of the U.S. Trade Representative (which was responsible for the Federal task force on services trade data), and with the Bureau of Economic Affairs of the Department of Commerce.

3. The FY90 Conference report on EPA appropriations eliminated $8.2 million worth of contracting and consultant services from the President's requested EPA budget. The conferees' concern about the "Agency's impulse to turn to contractors and consultants as a first resort on [certain tasks] which should be the responsibilities of a competent and professional Federal work force" stems from OTA's background paper Assessing Contractor Use in Superfund, highlighted by Senator Pryor in hearings in 1989.

4. Senator Heinz read the entire text of OTA's study, Paying the Bill: Manufacturing and America's Trade Deficit, into the Congressional Record. In his speech on the floor, Sen. Heinz described that report as "an important testament to some of the more intractable problems [in manufacturing and trade] we face", and as "making reality crystal clear." The senator also cited the report, Commercializing High Temperature Superconductivity, in his remarks on the problems the U.S. faces in moving from scientific concept to commercial product.

International Security and Commerce

1. ISC's ongoing assessment of Space Transportation Technologies has assisted work in the House Committee on Science, Space, and Technology on a bill (H.R. 2674) to "encourage the development....of a competitive U.S. space transportation industry." It has also contributed to deliberations within the Subcommittee on Space Science and Applications concerning future government investment in space transportation.

2. OTA testified before the Subcommittee on Defense Industry and Technology of the Senate Committee on Armed Services for their deliberations on the FY89 and FY90 defense authorization bills.

3. OTA testified before both Senate Foreign Relations and House Foreign Affairs (Subcommittee on Arms Control, International Security, and Science) on seismic verification of nuclear testing treaties.

4. ISC delivered a staff paper reviewing the DOE "2010" report to the Senate Committee on Armed Services as input to its deliberations on cleaning up and modernizing the nuclear weapons construction sites.

10.5. Changes in Prior Plans for FY 1989 for the Energy, Materials, and International Security Division

During Fiscal Year 1989, the Energy, Materials, and International Security Division essentially accomplished its goals, with approved modifications and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 20 for the breakdown of the differences in estimated and actual Division spending for FY 1989.)

10.6. FY 1990 and FY 1991 Priorities for the Energy, Materials, and International Security Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Energy, Materials, and International Security Division may be asked to undertake in Fiscal Years 1990 and 1991. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Energy and Materials

Energy Efficiency
Environmental policy and/or economic conditions are increasingly providing incentives for pursuing or mandating energy efficiency and conservation in many economic

11.3. Role of the Health and Life Sciences Division

The Health and Life Sciences Division comprises 3 programs: Biological Applications; Food and Renewable Resources; and Health.

The Biological Applications Program assesses state-of-the-art technologies arising from the cutting edge of biological science. Its broader responsibility is to help Congress understand complex technologies in biomedical sciences. Early warning is very much a part of the Program's charter, and some studies explore potential future applications of biological technologies. Because many of these new technologies have potential impacts that are of great social and political significance, ethical analysis is often a component of the assessments conducted by the Program.

The scope of the Food and Renewable Resources Program includes all agriculture-related technologies used to provide society with food, fiber, and chemicals, and technologies that enhance or jeopardize the ability to sustain in perpetuity the renewable resource bases that make such production possible. Agriculture itself is defined in the broad sense, including all crop and livestock production and forestry. Attention also is given to the impact that technology has had and is likely to have on how the agricultural system is organized, who controls it, and where it is heading. Further, the Program covers renewable resources that presently may not be considered or produced as crops, but that support such production and are fundamental to human needs.

The charter of the Health Program, the analysis of technological applications that affect human health, is reflected in three primary types of efforts: 1) assessments of clinical and general health care technologies and related policy areas; 2) assessments in the area of environmental and occupational health; and 3) collaboration with, and assistance to, other Programs on health-related issues in projects. The relationship of health care technology to financing, organization, and systems issues is a growing area of Program activity due to increased and focused Congressional interest. The Program's responsibilities include mandated reviews of protocols for studies of Agent Orange and of health effects among military personnel exposed to atomic bomb tests.

11.4. Accomplishments of the Health and Life Sciences Division

In FY 1989, the Health and Life Sciences Division published 3 assessment reports and 1 special report:

- Technologies to Detect Pesticide Residues in Food
- Enhancing the Quality of U.S. Grain in International Trade
- Grain Quality in International Trade: A Comparison of Major U.S. Competitors
- New Developments in Biotechnology: Patenting Life (Special Report)

In addition, the Division produced 1 background paper, 10 staff papers, and testified 9 times.

Listed below are several examples of direct legislative use of the Division's work:

Biological Applications

1. OTA updated information in the assessment report, Losing a Million Minds: Confronting the Tragedy of Alzheimer's Disease and Other Dementias, to prepare a comparison of Federal biomedical research expenditures for Alzheimer's disease, cancer, heart disease and AIDS for the House Select Committee on Aging. Congressman Roybal used the information in a hearing at which he introduced the Comprehensive Alzheimer's Assistance, Research and Education Act (H.R. 1490).

Staff of the House Committee on Energy and Commerce, Subcommittee on Health and the Environment, and Congressman Ron Wyden's staff consulted with OTA project staff about legislative language to describe eligibility for services in the Medicaid Frail Elderly Community Care Amendments of 1989 (H.R. 1453), which were later incorporated in the omnibus budget reconciliation legislation.

2. OTA's recent special report, New Developments in Biotechnology: Patenting Life, was cited by Rep. Robert Kastenmeier, Chairman of the House Judiciary Subcommittee on Courts, Intellectual Property, and the Administration of Justice, in introducing H.R. 1556 (the "Transgenic Animal Patent Reform Act") and H.R. 1557 (to regulate the use of transgenic animals). OTA staff testified at a Subcommittee hearing on September 13, 1989 on H.R. 1556.

   OTA staff for Patenting Life were consulted by the Senate Judiciary Subcommittee on Patents, Copyrights, and Trademarks regarding potential legislation regarding biotechnology and subject matter patentability.

   Hearings before the House Judiciary Subcommittee on Courts, Intellectual Property, and the Administration of Justice also featured this study. All witnesses appearing before the Subcommittee were asked to choose which OTA options they preferred, and to compare OTA's options to those chosen by the sponsors of H.R. 1556.

3. OTA staff for the ongoing assessment, Biotechnology in a Global Economy, conducted a workshop on Coordination of Federal Biotechnology Research and Regulation that was designed, in part, to provide requesting committees with Federal agency views on research and regulatory issues. Staff of the requesting committees participated in the workshop.

Food and Renewable Resources

1. In the Congressional Record of April 6, 1989, Senator Dodd is quoted as citing OTA's report, Pesticide Residues in Food: Technologies for Detection, as partial justification for his support of the Food Safety Amendments of 1989.

2. The Chairman and Ranking Minority Member of the House Committee on Science, Space, and Technology wrote to OTA on January 27, 1989, stating that, "the National Biological Diversity Conservation and Environmental Research Act, which was introduced during the Second Session of the 100th Congress and had 90 cosponsors, relied upon many of OTA's options." These options were provided in contained in OTA's study on Technologies to Maintain Biological Diversity. Findings and options from this report were used extensively in drafting H.R. 1268, which will likely go to markup in late 1989. Companion legislation is contained in Sen. Gore's Comprehensive Global Protection bill (S. 210).

3. Staff of the Senate Committee on Agriculture used OTA's 1984 report, Technologies to Sustain Tropical Forest Resources, to prepare legislation on global warming. One of OTA's options, to include agroforestry research in various international agricultural research centers, was included in the bill.

4. The Senate and House Agriculture Committees are using OTA's report Enhancing the Quality of U.S. Grain for International Trade to prepare legislation on the grain industry. Many of the policy options in the report are being seriously considered in the legislation.

5. The House and Senate Agriculture Committees are using information gathered for the on-going study, Emerging Agricultural Technologies: Issues for the 1990s, to prepare legislation on the structure, organization, and funding of the U.S. food and agriculture research system. The Committees are also using information generated by the project on the impact of new technologies (mainly biotechnology) on the dairy industry in drafting the 1990 Farm Bill.

6. Multiple recommendations from the Grassroots Development: The African Development Foundation (ADF) study were found in the bill making appropriations for foreign assistance (H.R. 2939) for the fiscal year 1990. Rep. Wolpe used OTA's study to formulate the language for the House bill.

   OTA staff met with the Senate Appropriations Foreign Operations Subcommittee staff and discussed the Locust report and other issues concerning ADF of interest to the committee. Recommendations were given to staffers in the writing of two sections of the Committee Report accompanying the FY 1990 Appropriations bill, dealing with desert locusts and grasshopper infestations, and integrated pest management.

7. This year OTA assisted the House Committee on Appropriations in the analysis and preliminary drafting of issues to be included in new legislation on Debt-for-Nature Swap for developing countries. Two OTA assessments, Technologies to Sustain Tropical Forest Resources and Technologies to Maintain Biological Diversity, provided the basis for much of the underpinnings of the new legislation (H.R. 3010). In addition, material in OTA's 1987 staff paper, Aid to Developing Countries: The Technology/Ecology Fit, played a part in developing the new legislation.

8. The House Foreign Affairs Committee's Hamilton Commission used numerous OTA publications to prepare a report on the reorganization of the U.S. Foreign Assistance Act (FAA), including: Technologies to Sustain Tropical Forest Resources, Technologies to Maintain Biological Diversity, Innovative Biological Technologies for Lesser Developed Countries, Grassroots Development: The African Development Foundation, Enhancing Agriculture in Africa: A Role for Development Assistance, Science and Technology for Development, and Africa Tomorrow: Issues in Technology, Agriculture, and U.S. Foreign Aid.

Health

1. H.R. 665, a bill to amend the Drug-Free Schools and Communities Act of 1986 to require that grant funds provided under the Act be used to provide education relating to the use of tobacco products, and to prohibit the sale of cigarettes to minors, referred to a staff paper produced by OTA in 1985 that estimated that smoking costs the people of the United States $43 billion in lost production and $22 billion for related diseases each year.

2. In the debate on S. 339, the Infant Mortality and Children's Health Act of 1989, Senator Shelby stated that: "These low birthweight babies are at the greatest risk for high mortality and morbidity, according to an Office of Technology Assessment study. Neonatal intensive care for these babies is also one of the most costly of all hospital admissions. The OTA reported that the U.S. health care system saves somewhere between $14,000 and $30,000 in hospitalization and long-term care costs for every low birthweight birth avoided." The OTA report was entitled Case Study #38: Neonatal Intensive Care for Low Birthweight Infants: Costs and Effectiveness.

3. Staff of the Health Program's Rural Health Project provided a briefing and background information for the use of the Senate Rural Caucus at a press

conference it held on various issues of rural health delivery and status.

4. OTA provided background information and statistics on obstetrician rates of participation in Medicaid to Congressman Leland for use in a hearing related to that topic. The information was developed for our assessment, Healthy Children.

   OTA provided information gathered during this assessment on childhood immunizations, well-child care, and maternal and child health outreach programs for preschool children to Senator Dodd. These were requested as part of an initiative on child health and immunizations.

5. Based on OTA's work (a staff paper and workshop) related to the National Academy of Sciences' Medical Follow-up Agency, Senator Cranston wrote to the Department of Veterans Affairs, the Department of Defense, and the National Institutes of Health, asking them to provide core funding of $500,000 for five years (split 40 percent, 40 percent, and 20 percent). After all three agencies responded negatively, Senator Cranston wrote to the Chairs of the Senate Appropriations Committee and the three relevant Appropriations subcommittees -- VA, HUD, and Independent Agencies; Defense; Labor, Health and Human Services, Education, and Related Agencies -- urging them to "develop a joint proposal to support MFUA" for 5 years, as OTA recommended. In the letter, Senator Cranston stated the conclusions of our staff paper to support the request.

6. OTA presented testimony on the medical safety and appropriateness of having optometrists provide postoperative care to cataract surgery patients at a hearing held by the House Ways and Means Committee on fiscal year 1990 budget issues relating to Medicare reimbursement for outpatient surgery. A staff paper, Appropriate Care for Cataract Surgery Patients Before and After Surgery, provided the basis for this testimony, and the paper's text was also printed in the record of hearings held by the Senate Special Committee on Aging. In addition, more than a dozen Members of Congress asked OTA to respond to constituent mail on the appropriateness of having optometrists provide postoperative care to cataract surgery patients.

7. OTA's case study, Nurse Practitioners, Physician Assistants and Certified Nurse Midwives: A Policy Analysis, was quoted by Senator Daschle in the floor statement as justification for the aims of his bill, S. 1384, which called for the amendment of the Social Security Act to allow direct reimbursement of nurse practitioner or clinical nurse specialist services in rural areas under Part B of the Medicare Program. Nurse Practitioners was also cited by staff to Senator Inouye in a speech concerning the reimbursement of non-physician health professionals.

   Rep. Edward Roybal, chairman of the House Select Committee on Aging, also relied on information from Nurse Practitioners when he introduced the Nursing Shortage and Nurse Reimbursement Incentive Act as a strategy to attract more nurses. He used the OTA study to reinforce his argument that reimbursing nurse practitioners in place of physicians, when appropriate, would reduce health care costs.

8. OTA provided background information and briefings to committees drafting legislation to increase Department of Health and Human Services funding for "effectiveness and outcome research" (health services research related to the effectiveness of medical technologies and to the assessment of quality using patient outcomes). In September of 1989, OTA was a co-sponsor and organizer of a conference on Effectiveness Research, at which Congressman Gradison and Congressman Moody spoke.

9. Senator Bentsen and the Senate Finance Committee used background material, including the OTA definition of technology dependent children, in putting together its finance package for home care for chronically ill children. The information and definition are from OTA's technical memorandum, Technology-Dependent Children: Hospital v. Home Care. H.R. 832, which would expand Medicaid coverage for technology-dependent children, also adopted OTA's definition of "technology-dependent children.

11.5 Changes in Prior Plans for FY 1989 for the Health and Life Sciences Division

During Fiscal Year 1989, the Health and Life Sciences Division essentially accomplished its goals, with approved modification and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 20 for the breakdown of the differences in estimated and actual Division spending for FY 1989.)

11.6 FY 1990 and FY 1991 Priorities for the Health and Life Sciences Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Health and Life Sciences Division may be asked to undertake in Fiscal Years 1990 and 1991. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Biological Applications

Biomedicine of Addiction
There is considerable congressional interest in technical/neuroscience approaches to addicting drugs; pharmaceutical approaches have been and are being developed to combat their effects, and more is being learned about the biological basis of their addicting and other properties. After some delay funding of research in this area has been directed to the National Institute on Drug Abuse. Congress needs to understand what such approaches can contribute to the war on drugs and what needs to be done to improve our understanding of these approaches. This study would be carried out in cooperation with a complementary effort in the Health Program.

Quality Assurance of Long Term Care of Elderly Citizens
Congress has mandated a major look at long term care issues by establishing the "Pepper Commission". There will be a need to follow up and extend the work of this commission. One possible effort would characterize long term care facilities, identify and evaluate measures of their adequacy, apply these measures, and develop policy options that could help provide high quality long term care for elderly Americans.

12.3 Role of the Science, Information, and Natural Resources Division

The Science, Information, and Natural Resources Division comprises 3 programs: Communication and Information Technologies; Oceans and Environment; and Science, Education, and Transportation.

The Communication and Information Technologies Program is concerned with technologies that create, read, store, manipulate, transmit, or display information. Primarily these are electronic technologies exemplified by computers and communications systems. The core responsibilities of the Program require monitoring the research and development of new information technologies and assessing the technological state of the art in these areas as well as trends in basic research and development. The Program also studies telecommunications regulation, information policy, and applications of information technology in the public sector.

The Oceans and Environment Program has responsibility for all ocean-related questions, including ocean resources and maritime policy, and for large-scale environmental issues, such as climate modification and water pollution. As a result of changing Congressional interest, the Program has developed capability for analyzing the difficult questions in which the overriding concern lies with the environmental effects of decisions. The work of the Program usually falls under one of five basic categories: federal services, natural resources, pollution control, marine industry, and large-scale environmental issues.

The Science, Education, and Transportation Program is responsible for work in the broad areas of science policy (basic research direction and resource allocation), education (in grade K through graduate school and programs for adults not based on job skills), and the more technology specific area of transportation. For purposes of Program development: (1) "science" includes issues surrounding the health of the scientific enterprise; (2) "education" refers to in-school and other methods, practices, and philosophy for people from early childhood through adult; and (3) "transportation" refers to all modes of transport - vehicular, rail, air, and water.

12.4 Accomplishments of the Science, Information, and Natural Resources Division

In FY 1989, the Science, Information, and Natural Resources Division published 3 assessment reports and 1 interim summary:

- Informing the Nation: The Future of Public Electronic Printing, Publishing, and Dissemination
- Catching Our Breath: Next Steps for Reducing Urban Ozone
- Polar Prospects: A Minerals Treaty for Antarctica
- Facing America's Trash: What Next for Municipal Solid Waste (Interim Summary)

The Division also published 1 special report, 1 technical memorandum, and 6 background papers:

- Safer Skies With TCAS: Traffic Alert and Collision Avoidance System (Special Report)
- Elementary and Secondary Education for Science and Engineering (Technical Memorandum)
- Issues in Medical Waste Management
- Evaluation of Options for Managing Greater-Than-Class-C Low Level Radioactive Waste
- Higher Education for Science and Engineering
- High School Vocational Education: Measures of Program Performance

- Technologies for Reducing Dioxin in the Manufacture of Bleached Wood Pulp
- Competition in Coastal Seas: An Evaluation of Foreign Maritime Activities in the 200-Mile EEZ

In addition, the Division prepared 5 staff papers and testified 14 times.

Listed below are several examples of direct legislative use of the Division's work:

Communication and Information Technologies

1. The Chairman of the Subcommittee on Procurement and Printing, House Committee on Administration, wrote that OTA's assessment, Informing the Nation, provided the impetus for the subcommittee's hearings on Title 44 of the U.S.C. with the following conclusion: "Congressional action is urgently needed to resolve federal information dissemination issues and to set the direction of federal activities for years to come." He also stated that the subcommittee would rely on OTA and its report in the legislative review hearings.

The Chairman of the Subcommittee on Legislative, House Committee on Appropriations, made the following statement at the subcommittee's hearing: "the timing of these hearings could not be more appropriate. As the Office of Technology Assessment (OTA) recently concluded, electronic technologies are making significant inroads in Federal information dissemination, creating new opportunities for improving efficiency, reducing costs, and expanding access to government information users. At the same time, however, OTA found that the printing statutes are increasingly unable to provide clear guidance on how these technologies can best be utilized to serve the needs of the Government and the public.

"Overall, the OTA report makes a convincing case for Congressional action to resolve these problems and set the direction of Federal information policy for the years to come. I encourage you to make the fullest possible use of the OTA's ground-breaking report in your review of Title 44, and I support you in this effort to increase Congress' understanding of the problems and opportunities that confront the Government's printing program and the GPO today."

2. Interim results from OTA's ongoing assessment of Information Technology and Research have been used in developing legislation in both the House and Senate. The Chairman of the Senate Subcommittee on Science, Technology, and Space distributed copies of OTA's background paper, High Performance Computing and Networking for Science, to all members of the Senate. OTA also testified last spring at hearings held by the House Subcommittee on Science, Research, and Technology on the state of the supercomputing industry.

3. Rep. Gerald D. Kleczka of the House Government Operations Committee cited OTA's findings on the need for an electronic Freedom of Information Act in introducing H.R. 2773, "The Freedom of Information Public Improvements Act of 1989."

Oceans and Environment

1. S. 587, a bill to amend the Marine Protection, Research, and Sanctuaries Act to protect marine and near-shore coastal waters through establishment of regional marine research programs, and S. 1178, the Marine Protection Act of 1989, cited a finding from OTA's assessment, Wastes in Marine Environments, that the overall health of marine and coastal waters is declining or threatened.

This report was also cited by Senator Lautenberg as he introduced S. 1179, the Comprehensive Ocean Assessment and Strategy Act of 1989: "The Office of Technology Assessment, in a 1987 report, concluded that the overall health of our coastal waters is 'declining or threatened,' and that 'in the absence of additional measures, new or continued degradation will occur in many estuaries and some coastal waters around the country.' OTA also determined that contamination of the marine environment has a wide range of adverse effects on birds and mammals, fin fish and shellfish, aquatic vegetation and benthic organizations. Finally, OTA concluded existing programs, even if fully implemented, are not adequate to maintain and improve our coastal waters." He urged Congress to respond positively to the problems identified by OTA and others.

H.R. 2953, a bill to establish a comprehensive marine pollution restoration program, to amend the Federal Water Pollution Control Act and the Marine Protection, Research, and Sanctuaries Act, and for other purposes, also cites findings from OTA's work in this area.

2. H.R. 2459, a bill to authorize appropriations for the Coast Guard for fiscal year 1990, calls for the Secretary of Transportation to incorporate the results of past studies conducted by OTA and other respected organizations in a new study evaluating the relative worldwide operating and environmental safety records of tankers equipped with double hulls or double bottoms and those without those features.

A number of bills have been introduced on the oil spill issue since the EXXON VALDEZ spill, including the Oil Tanker Navigation Safety Act of 1989. At hearings and in House and Senate reports, OTA's past work on this subject has been referenced. The Senate Commerce Committee introduced findings from a 1975 OTA report at 1989 hearings and they were once again confirmed.

3. In requesting assistance in evaluating the provisions of competing clean air legislation, the Chairman of the Subcommittee on Health and Environment, House Committee on Energy and Commerce, wrote: "For the past eight years, OTA has played a leading role in the development of our understanding of air pollution and proposals for alleviating it. . . OTA can provide invaluable assistance to the legislative process in preparing these analyses. This is especially so given the extensive involvement of OTA with these issues over the past years. No other independent agency has your expertise in the critical issues."

4. The Chairman of the Subcommittee on Regulation, Business Opportunities, and Energy, House Committee on Small Business, wrote to OTA saying that OTA's background paper, Issues in Medical Waste Management, provided "the first real focus on this technologically and politically complicated issue." This background paper was referenced by the drafters of the Medical Waste Tracking Act, passed last October.

5. Both S.J.Res. 57 and H.J.Res. 226, which sought to establish a national policy on permanent papers, took note of OTA's assessment, Book Preservation Technologies, particularly OTA's estimate that only 15 to 25 percent of the books currently being published in the United States are printed on acid free permanent paper.

6. OTA initiated the recent assessment, Facing America's Trash, in anticipation of the reauthorization of the Resource Conservation and Recovery Act (RCRA). OTA has commented informally on more than 10 RCRA-related bills, including the two major reauthorization bills introduced in the Senate. Since release of the interim summary June, OTA has testified on four occasions, three of which directly involved legislation. These testimonies were: 1) MSW in general, House Energy and Commerce Committee (no legislation) 2) MSW in general, Senate Environment and Public Works (RCRA reauthorizations bills S. 1112 and S. 1113); 3) degradable plastics, Senate Governmental

Affairs (S. 244); and 4) Capitol Hill Recycling, House Committee on House Administration (H. Res. 104).

7. The OTA Director testified before the House Committee on Energy and Commerce in Sept. 1988, and the Senate Committee on Energy and Natural Resources in March 1989 on the energy implications of global warming, drawing on both ongoing work and earlier OTA studies. Numerous informal discussions and briefings have occurred with at least eight Committees of the Congress.

Science, Education, and Transportation

1. H.R. 53, a bill to amend the Hazardous Materials Transportation Act to improve hazardous materials transportation safety, included among its findings a citation to the effect that, "the Office of Technology Assessment has determined that while the Department of Transportation prescribes railroad tank car design specifications, it is not sufficiently involved in the design approval activities of the industry-based Association of American Railroads Tank Care Committee, and is not permitted to attend sessions where the designs are analyzed and evaluated." The report to which this bill referred, Transportation of Hazardous Materials, was also cited in the Congressional Record of January 20, 1989, where Hon. Dean A. Gallo noted that, "the July 1986 report to Congress by the Office of Technology Assessment showed that the transportation of hazardous materials is largely a regional phenomenon. The average trip length for trucks hauling chemicals, for example, is 260 miles. Based on their comprehensive analysis, OTA concluded that "annual DOT summaries of aggregate regional shipments could provide useful regional and State commodity flow data.""

H.R. 2234, a bill requiring the development of hazardous materials emergency response procedures, prohibiting the transportation of hazardous materials in certain obsolete railroad tank cards, and requiring a study of railroad tank care design procedures, also cited this study, saying that, "The Office of Technology Assessment has determined that while the Department of Transportation prescribes railroad tank car design specifications, it is not sufficiently involved in the design approval activities of the industry-based Association of American Railroads Tank Car Committee, and is not permitted to attend sessions where the designs are analyzed and evaluated."

2. OTA testified to the findings of a special report, Safer Skies With TCAS: Traffic Alert and Collision Avoidance System, before the Aviation Subcommittee of the House Committee on Public Works and Transportation. In his remarks opening the hearing, Chairman Oberstar stated, "I want to compliment OTA for the excellence of your work, the quality of the presentation made, and very fine analytical work accomplished with a very difficult subject. It is one which was accomplished with great skill and is a great service to the Congress." Subsequently, the conclusions reached were used as the basis for legislation passed by both the House and Senate modifying P.L. 100-233.

3. S. 880, a motor carrier safety bill, includes a provision requiring safety equipment that gives trucks greater visibility at night. This provision is taken directly from the options in OTA's report, Gearing Up for Safety.

4. Key ideas on performance assessment and requirements for continued evaluation of the use of various databases and methods in performance measurement, which were derived from OTA's background paper, Performance Standards for Secondary School Vocational Education, were incorporated in H.R. 7.

5. OTA's assessment, Educating Scientists and Engineers: Grade School to Grad School, and two supporting documents, Elementary and Secondary Education for Science and Engineering and Higher Education for Science and Engineering, provided the basis for

testimony before the Subcommittee on Science, Research, and Technology of the House Committee on Science, Space, and Technology. On the basis of this work and preliminary work in broader aspects of science policy, OTA has briefed several committees and testified on the Hill and throughout the country.

12.5. Changes in Prior Plans for FY 1989 for the Science, Information, and Natural Resources Division

During Fiscal Year 1989, the Science, Information, and Natural Resources Division essentially accomplished its goals, with approved modifications and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 20 for the breakdown of the differences in estimated and actual Division spending for FY 1989.)

12.6. FY 1990 and FY 1991 Priorities for the Science, Information, and Natural Resources Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Science, Information, and Natural Resources Division may be asked to undertake in Fiscal Years 1990 and 1991. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Communication and Information Technologies

Copyright and Patent Protection of Computer Software and Databases
The U.S. leads the world in the innovation of computer software. Software is intellectual property. Unlike machines and manufacturing processes, software is difficult to protect from plagiarism or unauthorized use. In order to preserve the author's rights, encourage creativity, and preserve our competitive position in international markets, technical and legal means must be found to protect the intellectual property embedded in computer software, databases and computer devices.

Technical Standards for Telecommunications and Computers
Since the divestiture of AT&T in 1984, competition has stimulated the development of new telecommunications technologies that have merged computing technology with the telephone net. The ability to connect a variety of equipment in an efficient, compatible manner requires agreement on industry standards. Such standards are now set through a combination of ad hoc industry processes and government regulation in both domestic and international fora. Standards can be used as non-tariff barriers in international trade, as well as means to improve the performance of the communications network.

U.S. House of Representatives
Committee on Science
Hearing On
Scientific and Technical Advice to Congress

Witness:
Congressman Rush Holt

Questions For the Record

Appendix G

Office of Technology Assessment
Justification of Estimates
Submitted to the
Subcommittee on Legislative Branch Appropriations
1992

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Office of Technology Assessment
U.S. Congress

Fiscal Year 1992
Justification of Estimates

NOT FOR DISTRIBUTION UNTIL AFTER
HEARINGS ON LEGISLATIVE APPROPRIATIONS

Submitted to

Subcommittee on
Legislative Branch Appropriations

December 21, 1990

OTA reports represent comprehensive synthesis and analysis on some of the most controversial and costly issues faced by Congress . . . covering, for example, hazardous waste reduction and management, international trade and technology transfer, the future of American agriculture, the technology for defensive weapons, health care cost containment, and the future of biotechnology. These studies directly reflect the expressed needs and priorities of Committees of House and Senate. During the year, OTA served over 50 different Committees and Subcommittees of both houses, typically in response to bipartisan requests.

Relation of Work to Legislative Activities

OTA's role is neither to promote nor to discourage the development or the application of any particular technology or legislation but rather to help Congress determine whether or when some form of Federal government participation may make sense. OTA helps identify and clarify options; exposes misleading, unsupportable, or incorrect information; and helps raise the level of understanding in the debate about expensive and controversial technical issues.

In each section on accomplishments in OTA's divisions, we identify some activities during fiscal years 1990 and 1991 that illustrate the link between OTA's work and specific Congressional activity. Please see the following pages for this information:

page

Energy, Materials, and International Security Division
- Energy and Materials 41
- Industry, Technology, and Employment 42
- International Security and Commerce 44

Health and Life Sciences Division
- Biological Applications 59
- Food and Renewable Resources 60
- Health 61

Science, Information, and Natural Resources Division
- Communication and Information Technologies 76
- Oceans and Environment 76
- Science, Education, and Transportation 76

Mandate Avoidance

OTA works closely with members of TAB and the Appropriations Committees to maintain the authority of the Board to determine the agenda of the agency and the best use of OTA's limited resources for the whole Congress. Because demand for OTA assistance exceeds the resources made available to the agency, some committees attempt to initiate studies through new legislation rather than request studies through the Board (as was contemplated in OTA's enabling legislation). Mandates are strongly discouraged as a mechanism to obtain OTA's help, and potential mandates are often avoided when we are able to work with the interested parties prior to introduction of bills. Nevertheless, during the 101st Congress, a number of bills were introduced that would, if passed, mandate activities for OTA. For example:

H.R. 370 Last action: hearings held July 13, 1989.
Would direct the Office of Technology Assessment to conduct a study of the effects of the reclassification of anhydrous ammonia as a poisonous gas and transmit a report to Congress within 18 months of enactment.

H.R. 1078 Last action: referred to subcommittee May 1, 1989.
Would require OTA, within 2 years of enactment, to report to Congress on OTA's review of forestry projects and programs in tropical countries financed by the Agency for International Development and the extent to which these projects promote agroforestry and reforestation which discourages monoculture estates and which involve local people in the design, implementation, and monitoring of projects.

H.R. 1240 Last action: referred to subcommittee March 13, 1989.
Would require OTA, within 3 years of enactment, to conduct an evaluation of the performance of the Agency for International Development in carrying out this Act and report the result of the evaluation to Congress. [AID is directed to facilitate equitable economic growth and participatory development, national and regional economic integration, environmental sustainability, food security, and self reliance in the Caribbean through responsive aid and development policies and programs.]

H.R. 1746 Last action: Additional sponsors added October 16, 1989.
Would require OTA to conduct a study of: 1) all incentives under law for the protection and management of wetlands; 2) modifications to law that might improve their effectiveness; and 3) ways the federal government could encourage State and local incentives for wetlands protections. The report would be due one year from enactment.

H.R. 2076 Last action: referred to committee April 25, 1989.
Would require OTA to determine whether manufacturers are likely to comply with the average fuel economy standards without incentives, and if incentives are thought to be required, to suggest cost-effective incentives. The report would be due to the President and each House of Congress within 18 months of enactment.

H.R. 2091 Last action: referred to committee April 27, 1989.
Would amend title XVIII of the Social Security Act to require an annual report from the Director of the Congressional Office of Technology Assessment on changes in payment amounts for certain surgical transplantation procedures. The first report would be due one year after the date of enactment.

H.R. 2263 Last action: referred to subcommittee May 11, 1989.
Would require the Director of OTA to appoint the 13 members of a new Long-Term Care Advisory Council within one month of enactment.

H.R. 2655 Last action: received in the Senate July 11 1989.
Would require OTA to conduct an evaluation of the performance of the agency administering the Foreign Assistance Act within 3 years of enactment.

H.R. 3150 Last action: referred to committee August 4, 1989.
Would require OTA to conduct at study to determine the costs associated with various modalities of dialysis treatments provided to end stage renal disease patients and make recommendations regarding the level at which the composite rate used to determine the amounts of payments made should be established. This study would be delivered not later than June 1, 1990.
Would also require OTA, by July 1, 1990, to submit a report on alternative acquisition and reimbursement strategies for reducing expenditures for certain drugs used to treat end stage renal disease patients in a manner that does not adversely affect the quality of care provided to such patients.

H.R. 3299 Last action: conference held October 25, 1989.
Would require the Director of OTA to conduct a study of the appropriateness of Medicare reimbursement for experimental cancer treatment under research protocols, including an analysis of the costs to the Medicare program of such reimbursement, whether such reimbursement should be limited to cancer center hospitals, and any controls the program should place on such reimbursement. The report would be due to the Committee on Ways and Means in the House and the Committee on Finance in the Senate on June 1, 1992.

H.R. 4864 Last action: introduced May 17, 1990.
A bill to amend the Public Health Service Act to establish and coordinate research programs for osteoporosis and related bone disorders, and for ohter purposes. Would require the OTA Director to appoint members of the Advisory Panel on Osteoporosis and Related Disorders.

H.R. 5200 Last action: passed House on October 12, 1990.
Establishes a Scientific Advisory Board to review FAA's work in the area of explosive detection in airports and requires OTA to provide a Board member.

S. 1036 Last action: passed House March 27, 1990.
Would require OTA to include, in a study of the effects of information age technology on rural America, an analysis of the feasibility of ensuring that rural citizens in their homes and schools have the ability to acquire, by computer, information in a national library.

S. 1153 Last action: referred to House committee August 4, 1989.
Would require the Secretary of Veterans' Affairs to consult with OTA before compiling or analyzing any information; would require OTA to review all annual reports before they are submitted to Congress; and in the event NAS is unwilling to cooperate, would require OTA to consult on the issue of the establishment and maintenance of a tissue archiving system.

S. 1578 Last action: referred to subcommittee August 5, 1990.
Makes a representative appointed by the Director of OTA a member of the Board of Trustees for the National Center for Preservation Technology.

S. 1593 Last action: referred to committee September 12, 1989. Encourages OTA (among others) to assist the newly established National Commission on Natural Resources Disasters with personnel and support services without reimbursement.

S. 2822 Last Action: Senate subcommittee hearings held on October 4, 1990. Would require OTA to serve on Scientific Advisory Board to the Administrator of the FAA on explosives detection for Airport security.

OTA works closely with many committees to fulfill their requests for information through accepted channels. Efforts to avoid mandates may become more difficult as OTA's budget becomes tighter and the agency is forced to refuse or curtail a greater number of requests, even when made through proper channels.

New Mandated Activities

Despite our efforts to avoid mandates, OTA was tasked with two new analytical assignments as a result of legislation during the 2nd session of the 101st Congress, and three other activities.

The Small Business Administration Reauthorization and Amendments Act (Public Law 101-574), requires that OTA conduct a study of the effects of deregulation on the economic vitality of rural areas, by evaluating the effects of deregulation on financial institutions, airline service, bus and rail transport, the availability of schools hospital and telecommunications services. The act requires that the study be delivered in November, 1991.

As well, the Americans with Disabilities Act of 1990 (P.L. 101-336), requires that OTA study the accessibility of intercity buses to the handicapped. OTA's study is due by the end of 1994.

The Clean Air Act Amendments of 1990 requires OTA to "participate" in an EPA study of light-duty vehicle emissions. The study begins January 1, 2003.

P.L. 101-380, The Oil Pollution Liability and Compensation Act of 1990, requires OTA to appoint one member (of seven) to a Presidential Task Force on the Trans-Alaska Pipeline System.

P.L. 101-286, establishes the National Commission on Wildlife Disasters and calls for OTA to cooperate with the Commission, to the extent possible.

Existing Mandated Studies

The other active mandate for a study occurred in the 100th Congress. P.L. 100-435, enacted requires OTA to develop model performance standards, and review those actually developed by the Secretary of Agriculture, with regard to employment and training requirements within the food stamps program. A report to the Speaker, the President Pro Tempore, and the Secretary of Agriculture on the comparison/review is required.

As well, OTA continues to have the ongoing activity of monitoring veterans studies (P.L. 96-151) which mandates that OTA monitor and evaluate certain studies by the Department of Veterans Affairs. OTA's initial work led to additional mandates: P.L. 98-169 requires that OTA monitor certain federal research activities with regard to veterans exposed to atomic radiation; P.L. 99-272 requires that OTA monitor certain federal research activities with regard to women veterans.

Other Mandated Functions

OTA has also been assigned the task of appointing health-related commissions. P.L. 99-660 mandated the OTA Director to appoint a citizens' Advisory Panel on Alzheimer's Disease. This mandate does not include any reporting requirements for OTA. However, OTA is required to appoint and monitor the activities of three additional commissions (see below).

Prospective Payment Assessment Commission (ProPAC)

The Commission is an independent advisory committee mandated under the "Social Security Amendments of 1983" (Public Law 98-21, Section 601) that reform the Medicare program payment method.

Under the Statute, the OTA Director is charged with selecting the Commission members. The first Commissioners were appointed in 1983. Six Commissioners' terms expired in March 1990, and the Director made three reappointments and three new appointments.

Physician Payment Review Commission (PhysPRC)

The Physician Payment Review Commission is also an independent advisory committee mandated under the Consolidated Omnibus Budget Reconciliation Act of 1985 (P.L. 99-272). PhysPRC's purpose is to advise Congress and the Executive Branch on possible ways of reforming physician payment under the Medicare program.

As with ProPAC, the OTA Director is statutorily charged with selecting the Commission members. Initial appointments to the 13-member Commission were made in 1986, for terms ranging from one to three years. In April of 1990, the Director reappointed three Commissioners and appointed two new Commissioners.

Prescription Drug Payment Review Commission (PDPRC)

The Prescription Drug Payment Review Commission (PDPRC) was another independent advisory committee mandated under the Medicare Catastrophic Coverage Act of 1988 (P.L. 100-360). The Commission was mandated to report to Congress by May 1 of each year, beginning in 1990, concerning methods of determining payment for outpatient drugs covered under the new law.

As with the other commissions, the Director of OTA was charged with selecting the initial Commission members and making replacement appointments each year. The initial selections were made in December 1988. The Act included a requirement for OTA to report annually to the Congress on the functioning and progress of the Commission. **However, with repeal of the Medicare Catastrophic Coverage Act, the Commission ceased to exist, and no further work regarding the Commission will be required of OTA.**

Interagency Coordination

In carrying out OTA's mission as a shared resource to the committees of the Congress, our staff cooperate and interact extensively not only with congressional Members and staff, but also with staffs of other federal agencies, as well as with the private sector and universities around the world. This extensive networking not only serves to avoid duplication but also helps to increase Congress' analytical resource base and enables OTA to utilize the most up-to-date information available. As a consequence, a typical OTA assessment, costing $500,000, draws heavily upon the work of others that, taken together, would cost many times more.

Over the past several years, OTA and the three other Congressional support agencies have adopted a process to more fully utilize each other's expertise. This is as true in administrative areas as program areas; for instance, the Library of Congress provides accounting and disbursing services to OTA on a reimbursable basis, CRS provides access to the SCORPIO database and other research assistance, and GAO provides legal advice and opinions. The Comptroller General and the Director of CRS serve on OTA's Technology Assessment Advisory Council, and agency directors meet regularly to discuss issues of common concern. CBO, CRS, and GAO staffs coordinate with, and, in some cases, participate in OTA advisory panel meetings, symposia, and workshops. The four agencies share information on related studies and provide new data as input to each others' projects as appropriate to their areas of expertise. In addition, two or more agencies may collaborate in the preparation of testimony or general assistance for Congressional hearings. Examples from 1990 include:

- As a follow-up to the report, Replacing Gasoline: Alternatives for Light-Duty Vehicles, OTA initiated a project cooperatively with staff of CRS's Environment and Natural Resource Policy Division to investigate the implications of reformulated gasoline as an alternative fuel. In addition, OTA maintains a close, ongoing cooperative relationship with the Department of Energy's Office of Policy Planning and integration in its ongoing work on automobile fuel economy and alternative.

- In the course of the our on-going assessment, Fueling Development: Energy and Technology in Developing Countries, and particularly in the course of delivery of the interim report, Energy in Developing Countries, OTA staff have coordinated with GAO staff who are engaged in a review of the U.S. Agency for International Development's energy programs.

- CRS staff participated in the assessment "International Collaboration in Defense Technology". This facilitated the contribution of CRS expertise to an OTA assessment (filling in gaps in OTA staff expertise), while CRS staff benefited from OTA data gathering and analysis. CRS staff participated in an OTA workshop on Arms transfers to the Middle East held as part of this project.

- OTA staff coordinated closely with GAO on European defense collaboration

- OTA Background paper "Evaluating Defense Department Research", and discussions with the author, were used extensively in generating a CRS paper on the same topic.

- OTA staff discussed START verification with CBO staff, and reviewed drafts of a CBO paper on costs of verification. CBO staff were able to benefit from considerable OTA experience in the subject.

- OTA participated in two sister agency meetings (with CBO, CRS, and GAO) to discuss work on the future of defense industry and the conversion of defense industry to civilian applications.

- OTA staff provided extensive information to GAO for a project on arms control verification technology research.

- OTA staff is serving on an advisory panel for a GAO study on modernizing the strategic nuclear forces.

- OTA staff has worked closely with GAO staff doing a project on defense industry information bases and foreign content of U.S. defense systems.

- OTA staff briefed GAO staff on past OTA work relevant to Strategic Defense Initiative.

- OTA staff participated in (and briefed) a GAO C3I(defense command, control, communications, and intelligence) planning conference (November 6, 1989).

- During the summer of 1990, OTA, GAO, CRS and CBO people working on the effect of the defense build-down had the first of what are to be periodic coordination meetings.

- The Congressional Research Service uses Genetic Witness for background information on the technologies.

- Because Genetic Monitoring and Screening in the Workplace was just released, it is difficult to say which agencies are using the report. The Congressional Research Service just published a report brief on genetic screening, which OTA staff reviewed. The National Center for Human Genome Research at NIH has been interested in the report because they have been asked by Congress to examine workplace use of genetic screening for discriminatory purposes.

- OTA staff discussed with GAO the study on the sugar quotas/program with regard to its links with crop substitution programs.

- OTA staff discussed GAO study on alternative Bolivian agricultural products (focusing on cut flowers) and potential U.S. agricultural policies that inhibit import of such goods.

- During OTA's work on rural health care, CRS provided OTA with valuable information concerning community health centers and rural health clinics.

- OTA shared information being developed for our Health Care in Rural America report with GAO, which used the information as background in a study they did on rural drug abuse.

- CBO shared a great deal of background material on immunosuppressives and home therapy with OTA for OTA's project on Home IV and Immunosuppressive Therapies.

- OTA provided assistance to CRS on the preventive services package work CRS was doing for the Pepper Commission. Also, the Pepper Commission's report acknowledges general assistance from OTA and specifically cites OTA findings concerning efficacy and safety of medical procedures and uses OTA's estimate of the numbers of technology-dependent children.

- OTA staff provided advice and information on the costs of mammography to CBO.

- OTA Health Program staff met with GAO staff and advised them concerning the possibility of GAO's becoming involved in new studies on adolescents.

- OTA has hosted the sister agencies' Interagency Coordination Meetings on AIDS on three occasions -- May 18, 1987, April 13, 1988, and March 21, 1989.

- OTA provided the GAO advice on how to organize and conduct its study on communication issues. The GAO requested this advice on the basis of the OTA study, Critical Connections: Communication for the Future.

- OTA staff have frequent consultations, discussions with staff at CRS and periodically with staff at CBO and GAO involved with software-protection issues.

- OTA closely coordinated its study of scientific and technical information with the Congressional Research Service. CRS representatives participated in a review workshop and in all stages of the external review process.

- Electronic Bulls and Bears and Trading Around the Clock -- Throughout the project OTA staff were in touch with several members of the GAO and CRS staff working in related areas; with GAO staff OTA exchanged drafts of reports during the study.

- OTA participated in CRS-sponsored seminar on incentives and disincentives for recycling of municipal solid waste.

- The OTA staff working on policy options to reduce greenhouse gas emissions have had extensive interaction with all sister agencies. OTA has tracked closely the work at CBO (on carbon taxes), GAO (on research issues), and with CRS (on CO_2 reduction scenarios). Both CBO and CRS have reviewed our report and vice versa. OTA gave briefings (and was briefed in return) at least every six months during the course of the assessment.

- OTA staff worked with GAO staff on their peer review study, and meeting with Senate staff (requesters of the GAO study) to help them figure out their request. OTA staff also appeared as an invited witness on peer review for the special task force on the grantmaking procedures of the National Endowment for the Arts (called the Independent Commission).

- OTA continues to be a major player in the sister agency working group of infrastructure. GAO, CRS, and OTA all have major work under way, and have used this forum to help define appropriate niches and exchange information. OTA staff spoke at the CRS infrastructure policy meeting.

- OTA also seeks to coordinate its studies with those ongoing in the Executive branch, State and local government, and in private sector and international organizations. In addition, it is not uncommon for OTA reports to have a direct impact on activities outside the Legislative Branch. For instance:

- In the course of the completion and delivery of OTA's report, High Temperature Superconductivity in Perspective, OTA staff coordinated with the White House Office of Science and Technology Policy (OSTP), serving on two OSTP panels dealing with materials policy and with superconductivity. The OTA report was a basic reference document used in preparation of the report of the National Commission on Superconductivity, mandated by Congress in the Omnibus Trade Bill of 1988.

- The U.S. Environmental Protection Agency, a number of State regulatory agencies, the Electric Power Research Institute, and a wide range of other public and private institutions interacted extensively with OTA in the course of completing the Background Paper, Biological Effects of Power Frequency Electric and Magnetic Fields. The report has been widely cited as a balanced summary of the major issues in this very controversial area and, as a result, we continue to interact with these institutions as a reviewer of current work.

- The U.S. Department of Energy's Office of Energy Emergencies cooperated closely with OTA staff in the course of our study, Physical Vulnerability of Electric Systems to Natural Disasters and Sabotage. DOE was particularly helpful in securing difficult-to-locate information and in the national security review and classification of some of the more sensitive findings of the assessment. The cooperative relationship developed in the course of this assessment has led in part to the extensive use of the report by DOE and the Federal Bureau of Investigation in their current activities.

- The Federal Energy Regulatory Commission (FERC), many State Public Utility Commissions, the Electric Power Research Institute, and a wide range of other public and private institutions refer frequently in their current activities to OTA's assessment report, Electric Power Wheeling and Dealing: Technological Consideration for Increasing Competition. OTA continues to participate in review activities with these institutions based on the findings of the assessment.

- Over the last year, the National Research Council has initiated several major studies that follow up on recent OTA energy assessments. These were in areas of natural gas resource availability, nuclear power, alternative fuels, and alternative energy technologies. OTA staff have been fully involved in these efforts and in many cases providing briefings on the OTA assessments in the course of the NRC studies.

- Copies of Arming Our Allies have been in use a basic texts within parts of DoD and at DOE national laboratories.

- The OTA report Holding the Edge was used in the Defense Department management review as well as in internal DoD studies of laboratory reorganization and lab management reform.

- Several ISC reports on defense industry have been used in course work at the Industrial College of the Armed Forces.

- The Federal Aviation Administration, having come under heavy criticism for its airport security program, said it would wait until it had seen OTA's first report on counter-terrorism before reforming the program. The Assistant Secretary of Transportation for Intelligence and Security, charged with oversight of the FAA security program, has used the OTA report.

- The Department of Energy distributed the OTA report on START verification to the national laboratories.

- OTA staff briefed the Counsel of the Presidential Commission on Airline Security and Terrorism.

- The DOE recently created the Technology Transfer Project Group (TTPG) to implement the National Competitiveness Technology Transfer Act of 1989. The TTPG has the DOE-wide task of promoting technology transfer, and it oversees the labs' technology transfer efforts. TTPG has been using Making Things Better to help them come to grips with antitrust and intellectual property issues in technology transfer, and OTA has made a presentation to TTPG on possible antitrust obstacles to the transfer of technology from the labs to industry. In addition, the finding in MTB that, without a positive, high-level agency-wide effort, technology transfer is likely to remain bogged down has contributed to the status and stance of TTPG within DOE.

- OTA briefed the Undersecretary of Commerce on Making Things Better: Competing in Manufacturing. As a result, Mr. Sununu asked for a copy of the report, which was delivered to the White House. Also, the White House Office of Science and Technology Policy asked for several copies of MTB. Subsequently, Allan Bromley, the President's Science and Technology Advisor, has strongly advocated Federal R&D support for generic technologies of commercial importance. This was a major theme in MTB.

- OTA briefed a dozen Commerce Department officials on MTB, at their request. These officials expressed interest in and appreciation for the report, asked penetrating questions, and appeared satisfied with the answers.

- Two OTA programs managers participated in DOE's Math/Science Education Action, contributing as members of the Conference's Workshops to the DOE's Action Report.

- OTA participated in meetings of Federal and State people to advise the Food and Nutrition Service of the Department of Agriculture as they formulated performance based standards for their Employment and Training Program. Based on the findings of Technology and Structural Unemployment: Reemploying Displaced Adults and on preliminary findings from the then ongoing Worker Training: Competing in the New International Economy, OTA stressed the importance of good basic skills to getting a good job, and thus the importance of considering an educational attainment performance standard for the program. (OTA is mandated under the Hunger Prevention Act of 1988 to be consulted by the DoA as it develops its performance standards, and, further, to itself develop model performance standards, compare its standards with the DoA's standards, and report to the Congress.)

- In a report on the Superfund Program, the Science Advisory Board of the Environmental Protection Agency said that EPA should mount an aggressive site discovery program and delay cleanups at sites that pose no current risks. These recommendations of the SAB followed OTA's technical findings in Coming Clean. The SAB cited OTA in their report as an authority for their recommendations on these two points.

- Making Things Better, along with the Young Commission Report and the MIT study are making their rounds of Japanese companies and government offices as "pirated translations" and are reportedly receiving more attention in Japan than they did in the U.S. A Japanese language magazine called Will devoted much of their August 1990 issue to an in-depth discussion of MTB and the issues it raises.

- OTA has participated in meetings of the Federal Roundtable -- an interagency group to identify and distribute government developed education and training programs in the public domain, and ultimately to establish a clearinghouse of government training and education materials and programs.

- The U.S. Department of Education invited OTA to serve as a discussion initiator at the first National Conference on Workplace Literacy. OTA discussed basic skills needs of workers based on past work for Technology and Structural Unemployment and ongoing work for Worker Training: Competing in the New International Economy. In addition, OTA research aimed at defining how the components of workplace literacy programs differ from typical adult remedial education programs was discussed at the Conference.

- Various parts of the Department of Justice have used, and continue to use, Genetic Witness, including the FBI, the National Institute of Justice, and the U.S. Attorneys' Office. The report has been used by the latter in at least two Federal cases: *United States v. Jakobetz*, U.S. District Court, Burlington, Vermont and *United States v. Yee, Verdi and Bonds*, U.S. District Court, Toledo, Ohio.

- The National Institute of Standards and Technology was consulted and has also used Genetic Witness.

- Genetic Witness was directly used, on each in Texas, Wisconsin, Georgia (capital case), Arizona and California. The report is being used as a reference for the California Attorney General's DNA Advisory Board, for the legislative staff of the Assembly of New York, which passed a comprehensive bill to regulate forensic DNA analysis, and as background for privacy/DNA data banking proposals in Minnesota.

- Technical and policy material from New Developments in Biotechnology; Ownership of Human Tissues and Cells was cited in the California Supreme Court's July 1990 decision in *John Moore v. The Regents of the University of California et al.*

- Based on information in Confused Minds, Burdened Families about problems in connecting ethnic minority people with dementia to services, the Administration on Aging selected three grantees to develop better methods of linking these people to services.

- OTA information from New Developments in Biotechnology: U.S. Investment in Biotechnology was used in the President's budget submission to Congress (section on biotechnology).

- OTA staff were invited to review the USFS draft plan on the Caribbean National Forest & Luquillo Experimental Forest, by American Forest Association and U.S. Forest Service.

- OTA staff met with the Agency for International Development to discuss AID's new Initiative on the Environment. This is related to OTA's study Science, Technology and the Environment in Lesser Developed Countries.

- OTA staff briefed the board for International Food and Agricultural Development on International Agricultural research.

- The Bureau for Science and Technology (USAID) used A Plague of Locusts to evaluate its locust control research program and to plan future activities.

- The U.N. Food and Agriculture Organization used A Plague of Locusts to bolster its work in locust plague prevention.

- The Information Centre for Low External Input and Sustainable Agriculture used Enhancing Low Resource Agriculture to plan a major international workshop on low-resource agriculture in developing countries.

- Federal Grain Inspection Service of the U.S. Department of Agriculture has extensively used the OTA report Enhancing the Quality of U.S. Grain for International Trade in revamping grain quality grades and standards and in establishing criteria for the standardization of grain inspection technologies.

- The Assistant Secretary's Office of Science and Education of the U.S. Department of Agriculture has used the OTA report Agricultural Research and Technology Transfer Polices for the 1990s in establishing improved mechanisms and procedures in determining priorities for all research and technology transfer activities within USDA.

- OTA staff continued liaison with approximately 40 Federal Departments and agencies in its assessment of Beneath the Bottom Line: Agricultural Approaches to Reduce Agrichemical Contamination of Groundwater.

- A copy of Integrated Renewable Resource Management for U.S. Insular Areas was provided to the White House to serve as briefing material for President Bush in his recent trip to the Pacific Basin.

- U.S. Geological Survey (USGS) conducted an information briefing and planning meeting with F&RR on its ongoing analysis of the relationship of Glaciated geologic materials and agriculture in the lower 48 States.

- OTA staff worked with the Soil Conservation Service South National Technical Center on interpretive mapping of pesticide leaching potential.

- OTA staff is assisting the U.S. Man and the Biosphere Program's Caribbean Islands Directorate with planning of a conference on economic, cultural and environmental issues in Caribbean islands ecotourism.

- Based on work underway for the OTA background paper on U.S. Universities and Foreign Aid: Technical Assistance to Agriculture, Natural Resources, and Environment, the Agency for International Development's Board for International Food and Agricultural Development (BIFAD) established a new task force to prepare an in-depth study on world population pressure on the food supply, the capacity of the world to continue to increase the food supply, and the capability to develop sustainable agricultural systems that will maintain and/or enhance the environment. BIFAD stated in writing that "the idea for this study emanated directly from the OTA Seminar on Title XII in 1989....The synergistic effect of being in a 'think-tank mode' sponsored by OTA was most effective."

- The director of OTA's Adolescent Health project was a member of the lead panel in the U.S. Department of Health and Human Services' annual Child Health Day October 1, 1990. This year Child Health Day focused on "Adolescent Health: Links to the Future." The project director, described OTA's forthcoming adolescent health report and participated in the general panel discussion.

- Staff of OTA's Health Program provided extensive information to the Health Care Financing Administration's office of Coverage Policy on cervical cancer and pap smears -- from sampling to lab quality to accuracy in elderly women to high-risk vs low-risk women.

- OTA's Home IV and Immunosuppressive Therapies project has coordinated its activities with the Health Care Financing Administration (HCFA). Staffs of OTA's project and of HCFA held an extensive joint meeting. HCFA also provided us with numerous useful ideas, background information, and same actuarial estimates.

- The project director for OTA's Health Care in Rural America report has been asked to appear before an advisory committee of the Health Resources and Services Administration's Bureau of Health Professions next month to talk about rural primary care practitioners.

- A senior analyst on OTA's project Health Care in Rural America was asked to participate in the Public Health Service Task Force on Rural Health Data.

- OTA provided multiple copies of the Health Care in Rural America report to the Department of Agriculture's Rural Health Care Information Center for their use in responding to information requests. The project director for the OTA report was interviewed on the Department of Agriculture's radio program, which is broadcast nationwide.

- OTA advised staff of "Our Children's Future" (the successor to the National Commission on Infant Mortality) on topics and speakers for their congressional seminar on early adolescence.

- In developing recommendations for the use of pneumococcal vaccine, the Center for Disease Control's Immunization Practices Advisory Committee drew on OTA's update of the faccine's cost effectiveness (*Update of Federal Activities Regarding the Use of Pneumococcal Vaccine*).

- In conducting OTA's study on Rural Health Care, staff worked closely with the DHHS's Office of Rural Health Policy, sharing information with them, critiquing their drafts upon request, attending their meetings, giving data to them or their contractors upon occasion, sharing our own outlines and drafts with them. OTA also kept in close coordination with the Prospective Payment Assessment Commission, regarding rural health. The staffs of OTA's rural health project and ProPAC's staff exchanged information and, importantly, shared data several times. In addition, we shared data and information on rural health epidemiology with the Inspector General's office of the Public Health Service.

- At their request, copies of our Adolescent Health "covariations" paper were distributed to an NICHD-funded National Research Council panel on high risk youth.

- The SEC has requested and received at least 30 copies each of Electronic Bulls and Bears and Trading Around the Clock for the information of the Commission and for internal staff use. The Federal Reserve Board of Governors also asked for several copies. Most of the self-regulatory organizations (e.g., stock and futures exchanges and the National Association of Securities Dealers) have also requested and received multiple copies of the reports.

- OTA closely coordinated its study of scientific and technical information with the major Federal science agencies and the White House Office of Science and Technology Policy. Agency and OSTP officials participated in a review workshop and in all stages of the study process. OTA briefed OSTP and agency officials on the study results.

- OTA's final report Helping America Compete: The Role of Federal Scienfitic and Technical Information was used as a focal point for follow up actions by OSTP, the Office of Management and Budget, and various Federal agencies and interagency coordinating groups.

- OTA staff has worked with 4 different divisions of EPA, several offices with DOE, and interacted with Treasury, Commerce, State Dept., AID, USDA, USGS, and the National Academy of Sciences during the course of the report on Climate Change. Each agency has reviewed relevant material.

- In the *Federal Register* containing 14 CFR Parts 121, 125, and 129, final rules for the TCAS II Implementation Schedule which substantially revises the FAA approach and schedule, resulted directly from the OTA study, Safer Skies with TCAS: Traffic Alert and Collision Avoidance System, issued in February 1989. The revision will lead to safer passenger travel, while considering the needs of both airlines and TCAS manufacturers.

- OTA staff provided critique to the Department of Education (Assistant Secretary for Research) on R&D initiatives for technology. OTA also supplied information and copies of Linking for Learning to the National Telecommunications and Information Administration, to assist them in developing their comprehensive study of the domestic telecommunications infrastructure.

- OTA staff have participated in many executive branch seminars, task forces, and conferences, including the Transportation Policy Conference and Transportation Research Board.

- OTA staff has continuing exchanges of information with two analytical groups developing policy for education and training. These are the office of Educational Research and Imporvement (OERI) (the Department of Education) and the Secretary's Commission on Assessing Necessary Skills (SCANS) (the Department of Labor). They are particularly interested in our continuing work on children in at-risk situations, and on testing information and data.

6. Changes in OTA's Prior Plans for FY 1990

During Fiscal Year 1990, OTA essentially accomplished its goals, with approved modifications, negotiated reductions, and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to make adjustments, and also the fact that the agency must operate with a reduced level of resources.

The chart below shows the variations in actual obligations for the OTA divisions for FY 1990 from the planned obligations for FY 1990 provided on Schedule A in the FY 1991 budget justification. The chart on page 21 provides a summary by object class of projections and actual expenditures for FY 1990.

Changes in OTA's Prior Plans
($000)

	1990 (est.)	1990 actual	% change
Division A	4,275	4,215	(1.40)
Division B	4,275	4,216	(1.38)
Division C	4,275	4,183	(2.15)
Division G	5,746	5,711	(0.61)

7. OTA's Goals for FY 1992

Congress' agenda in FY 92 is only partially predictable, and some of the events that could dominate its attention aren't even predictable at this point. This means that OTA must carefully manage its ability for "flexible response", by continuing to stay abreast of key issued involving science and technology. We fully expect that a number of current issues will remain high on our agenda and may become even more so: the strengthening of the U.S. civilian industry to compete in a global economy, the peaceful transformation of centrally planned economies into market economies, the management of local, regional, and global environment, and the restructuring of U.S. security to match the uncertain and changing nature of threats.

10.3. Role of the Energy, Materials, and International Security Division

The Energy, Materials, and International Security Division comprises three Programs: Energy and Materials; Industry, Technology, and Employment; and International Security and Commerce.

The Energy and Materials Program is responsible for assisting the Congress in understanding the technological possibilities for developing our energy and materials resources and the consequences of these developments for society. In this way, the Program can help the Congress ensure rational resource development such that economic growth is maintained, undesirable side effects are kept to a minimum, and the resource base is sustained for future generations. The Program covers those technologies that concern the extraction, delivery, and use of energy and materials. Although primarily directed at domestic resources, the Program also is concerned with world markets and policies, including imports and exports of energy and materials.

The Industry, Technology, and Employment Program examines how technology affects the ability of U.S. industry to contribute to a healthy national economy. Its responsibilities include consideration of the competitiveness of U.S. industries in international markets, trade and economic development issues, the number and nature of employment opportunities, needs for worker education, training and retraining, and ways to ease adjustment in structural economic transitions. A Program with a specific employment focus is new at OTA (the Program was established in 1983), although most assessments have considered employment impacts, and employment and training issues have been of central importance in several studies. This section of the program centers on the quantity, nature, and quality of jobs, the nature of and changes in job skills, and training and retraining across the work force.

The International Security and Commerce Program deals with national security, space technology, international relations generally, and international technology transfers. The Program's work in national security includes an assessment of likely impacts of technological considerations on national security, which includes international stability, diplomacy, alliance relations, and arms control, as well as deterrence and defense. Assessment of defense industrial/technological base issues is an increasing part of ISC's work. The work on space technology involves a range of issues, such as space transportation, international cooperation and competition in civilian space activities, and space debris, in which technological progress, civilian exploration, commercial uses of space, and national security must be reconciled. ISC's work in technology transfer combines several perspectives: the national security and foreign policy considerations that lie behind export controls, a concern for the health and competitiveness of U.S. industry in international markets; and a concern for the objective of managing technology transfer in such a way as to contribute to favorable international economic development.

10.4. Accomplishments of the Energy, Materials, and International Security Division

In FY 1990, the Energy, Materials, and International Security Division published 6 assessment reports:

- Coming Clean: Superfund Problems Can Be Solved
- Making Things Better: Competing in Manufacturing
- Access to Space: The Future of U.S. Space Transportation Systems
- High Temperature Superconductivity in Perspective
- Physical Vulnerability of Electric System to Natural Disasters and Sabotage
- Worker Training: Competing in the New International Economy

The Division also produced 3 special reports and 5 background papers:

- The Containment of Underground Nuclear Explosions (Special Report)
- Arming Our Allies: Cooperation and Competition in Defense Technology (Special Report)
- Replacing Gasoline: Alternative Fuels for Light-Duty Vehicles (Special Report)
- Affordable Spacecraft: Design and Launch Alternatives
- Energy Use and the U.S. Economy
- The Royalty Management Program's Auditing and Financial System
- Nonferrous Metals: Industry Structure
- Orbiting Debris: A Space Environmental problem

In addition, the Division testified 16 times and prepared 5 staff papers.

Listed below are several examples of direct legislative use of the Division's work:

Energy and Materials

1. OTA interacted extensively with Senator Bryan's staff of the Senate Commerce Committee's Subcommittee on Consumer Affairs in introducing S. 1224, the Motor Vehicle Fuel Efficiency Act of 1989. This work is an interim report of OTA's ongoing assessment of Technological Risks and Opportunities for Future U.S. Energy Supply and Demand. Throughout the year, OTA staff briefed Senate and House members and staff on alternative fuels and automotive fuel economy and other energy technology issues being addressed in the assessment and testified several times on these subjects in the last year. Several of OTA options have provided middle ground in the debate over CAFE standards.

2. OTA's report, Replacing Gasoline: Alternative Fuels for Light-Duty Vehicles, was used as a reference document in the Conference Committee deliberations that resolved differences in the alternative fuels provisions between the House and Senate versions of the reauthorization of the Clean Air Act, S. 1630 and H.R. 3030.

3. This fall OTA initiated a special response study in the course of our on-going work of automotive fuel economy concerning the feasibility of extending CAFE "credits" for retiring older vehicles. OTA staff have interacted extensively with House Energy and Power Subcommittee, Senate Energy and Senate Commerce staff in examining such proposals as those suggested by Cong. Sharp and Senator Roth. As a result in part of OTA's analysis, most CAFE-related legislation likely to be reintroduced in the next session (e.g., Senator Roth's S. 2049 and S. 2237) will probably include some mechanism for dealing with older vehicles.

4. OTA's Background Paper, Biological Effects of Power Frequency Electric and Magnetic Fields, was the basis of a hearing convened by the Subcommittee on General Oversight and Investigations of the House Committee on Interior and Insular Affairs to consider H.R. 4801 introduced by Cong. Frank Pallone to establish a comprehensive federal research and information program on electric and magnetic field health effects and mitigation strategies. The report has been used extensively by other House and Senate Committees, especially in considering federal research priorities and policy issues relating to health effects of electric and magnetic fields. For example, the report was used as the basis for Cong. Brown's amendment regarding health effects of electromagnetic fields to H.R. 4873, the Environmental Research, Development, and Demonstration Act of 1990.

5. OTA's assessment report Electric Power Wheeling and Dealing: Technological Considerations for Increasing Competition, continues to be cited frequently in ongoing legislative discussions and hearings in the House Energy and Commerce Subcommittee on Energy and Power affecting regulation of electric utilities such as proposals to amend the Public Utility Holding Company Act, the Public Utilities Regulatory Policy Act, and the Federal Power Act, including H.R. 112, H.R. 3692, and S. 406.

6. OTA's reports, New Electric Power Technologies: Problems and Prospects for the 1990s, Nuclear Power in an Age of Uncertainty, and Starpower: The U.S. and International Quest for Fusion Energy continue to be used widely by energy R&D authorizing committees as a reference source. In particular, they were referred to frequently in the House Committee on Science and Technology's Subcommittee on Energy Research and Development's authorization hearing on the DOE R&D budget. In addition OTA staff were consulted frequently by Committee staff in the consideration of related bills such as S. 488, the Renewable Energy and Efficiency Technology Competitiveness Act (enacted as P.L. 101-218), H.R. 4808, the Solar, Wind, and Geothermal Power Production Incentives Act of 1990, and S. 324, the National Energy Policy Act of 1990.

7. OTA's ongoing project updating the 1984 OTA assessment, U.S. Vulnerability to an Oil Import Curtailment, has been important as background for hearings in both the House and the Senate considering energy policy measures in reaction to the current Mideast Crisis. OTA has testified three times on the subject since the project began.

Industry, Technology, and Employment

1. A major waste reduction bill passed the House this summer. (The corresponding Senate bill was not reported out of Committee until October.) Many of the provisions of both were motivated in part by OTA's waste reduction work, starting with its 1986 report Serious Reduction of Hazardous Waste. The House bill was incorporated into the FY91 budget reconciliation act passed in late October. The bill mandates a waste reduction program at EPA (which means that the existing program, also motivated in part by OTA's waste reduction work, is on a securer footing), authorizes $16 million, and requires adherence to the OTA definition of waste reduction, which makes a distinction between waste reduction and recycling, and to the OTA hierarchy, which places waste reduction as the action to be considered first in dealing with multimedia pollutants.

2. Based on its Superfund work, in particular its latest report Coming Clean: Superfund Problems Can Be Solved, OTA has continued to assist the Congress in understanding cleanups at sites of particular interest. We have assisted Congressman Brooks with the Brio site, Sen. Reid with the Carson River site, and Congressman Dingell with the Anderson site. Our work on the Brio site involved meeting, at Congressman Brooks' request, with citizens at a seminar organized by the mayor of Friendswood, Texas. OTA prepared an analysis of the proposed cleanup at Brio, which was quoted in a letter about the cleanup consent decree from Congressman Brooks to Attorney General Thornburgh. Brooks later praised the OTA analysis in a press release. Based in part on OTA's analysis of the proposed Anderson cleanup and its work in Coming Clean, Congressman Dingell has decided to open an investigation on how EPA uses treatability studies.

3. The Staff Paper U.S. Manufacturing: Problems and Opportunities in Defense and Commercial Industries provided technical and analytical support for S. 2825, the Defense Manufacturing Technology Enhancement Act of 1990, originating in the Senate Armed Services Committee, which was later incorporated in Chapter 149 of the Defense Authorization Act for fiscal 1991. These included more money in DoD for advanced manufacturing ($50 million earmarked in the budget reconciliation), increased funding and improved coordination of DoD's ManTech programs, as well as provisions dealing with manufacturing extension, concurrent engineering, and computer-integrated manufacturing. In addition, Congress increased the appropriation for DoC's Center for Manufacturing Engineering, one of the policy options in OTA's staff paper.

4. The findings in Making Things Better on the need for the development and diffusion of commercially important technologies were used by Congressional committees in planning and drafting various legislation. Making Things Better contributed to many of the items in the House Leadership's June 19 Congressional High-Technology Agenda, which listed about 25 legislative goals dealing with technology issues--some in bills already passed by the House, some in bills net yet passed, and some which had yet to be included in any bill. One example is the American Technology Preeminence Act, H.R. 4329, which would have authorized $50 million for NIST's Advanced Technology Program for FY 1990, $100 million for FY 1991, and $250 million for 1992. The Advanced Technology Program provides government cost-sharing to encourage firms or joint ventures to commercialize important discoveries or to refine manufacturing technologies. That bill, while passed by the House, did not become law; however, Congress' final appropriations for FY 1991 did include $36 million for NIST's Advanced Technology Program, an increase from $10 million authorized for FY 1990.

5. Making Things Better was released in a hearing of the full Senate Banking Committee on Feb 28. The Chairman, Sen. Riegle, described Making Things Better as "this very important piece of work." Sen. Shelby commented: "[OTA] appear to be doing an excellent and thorough job in determining why and to what extent we are losing our lead as a global leader." Sen. Heinz said: "I just want to commend [Dr. Gibbons] and his wonderful staff....for their usual extraordinarily clear, comprehensive and thoughtful analysis." Sen. Heinz also recommended that the academic community read "some of the OTA's excellent work." Sanford Kane, a witness at the hearings, a former Vice-President of IBM and former President of U.S. Memories said of Making Things Better: "I must say that it is extremely well done. It is thorough. It is to the point. And amazingly enough for this kind of document, it's very readable." The Committee report published the text of the Summary of Making Things Better in full.

6. OTA Director Gibbons and staff briefed Sen. Lieberman on Making Things Better. Partly as a result, Sen. Lieberman introduced S.2765, the Economic Growth Act, which proposed a number of measures to encourage improved manufacturing technology and employer-provided training.

7. Subsequent to the Gibbons/Lieberman meeting described in #6, OTA staff met with Sen. Lieberman's staff to discuss the human resource and work force education issues raised in MTB. Based on MTB, and a memo provided by OTA staff on human resources and competitiveness, the Senate Small Business Committee held hearings on Education and the U.S. Economy in Hartford CT, on August 16, 1990. Panels representing business, educational institutions, and economists discussed the issues.

8. Technical analysis arising out of OTA's worker training assessment was used by the Senate Labor and Human Resources Committee in drafting the proposed Technology Training Consortium Act of 1990 (introduced as Section 404 of S. 2114, the proposed Mathematics, Science, Engineering and Technology Education Act.) The Committee used OTA's technical comments for several provisions in Section 404; in particular the bill as introduced reflected OTA analysis on risk sharing in training investments, categories of workers in special need of training, and the need to address work organization as well as advanced technology in eligible programs. OTA also provided the Committee with background analysis of the characteristics and nature of existing industry training consortia. (NOTE: Section 404 was eventually dropped from the bill. The House counterpart bill did not have a comparable provision. However, Sen. Kennedy, who introduced the bill, has commented that he plans to introduce an industry training bill based on OTA's report in the 102nd Congress. See Item #9, below.)

9. OTA's assessment, Worker Training: Competing in the New International Economy, was released in late September, 1990. In a statement on the report, Sen. Kennedy, who, as Chairman of the Committee on Labor and Human Resources was one of the requestors of the assessment, said: "In my view, this report should serve as both a call to action and a blueprint for legislation that deserves high priority in the next Congress." Sen. Rockefeller, also a requestor, said: "This report both presents America with the warning signs of continuing on our current path and provides a road map to securing a more competitive future....Speaking as one U.S. Senator, I am committed to making the significant strides in worker training that are so clearly needed."

International Security and Commerce

1. Senator Bingaman and Senate Armed Services Committee staff were briefed on Holding the Edge, Arming Our Allies, and ISC's analysis of the DoD critical technologies plan.

2. The first report of the Counterrterrorism study was briefed to the staffs of the House Committee on Government Operations, the Senate Committee on Commerce, Science, and Tranportation, the Senate Committee on Governmental Affairs, the Senate Select Committee on Intelligence, the House Committee on Public Works, and the House Committee on Foreign Affairs.

3. Based on Holding the Edge and on-going work, ISC staff participated in discussions of ideas for giving defense laboratories a greater role in environmental research

4. Based on Holding the Edge and Arming Our Allies, staff of the Economic Stabilization subcommittee of the House Committee on Banking was briefed on problems of the defense industry.

5. Staff involved in drafting (and drafting revisions and updates to) the defense authorization bills and the Defense Production Act were briefed on relevant past ISC work, and held discussions with OTA staff continuing to work on relevant defense industry/technology issues. In several instances, the results of OTA analysis caused staff to rethink/revise items they had been drafting.

6. Based on Holding the Edge and Arming Our Allies, ISC testified on the defense industry at a field hearing of the Subcommittee on Procurement, Tourism, and Rural Development of the House Committee on Small Business.

7. ISC testified on international collaboration in defense development before the Subcommittee on Defense Industry and Technology of the Senate Committee on Armed Services.

8. The Containment of Underground Nuclear Explosions was used in debate over claims for compensation of those living near the Nevada Test Site.

9. On September 25, 1990, the Senate ratified the 1974 Treaty with the USSR on Limitation of Underground Nuclear Weapons Tests (the Threshhold Test Ban Treaty). The 1988 OTA report Seismic Verification of Nuclear Testing Treaties influenced these deliberations.

10. ISC testified on defense industry and technology before the Senate Committee on Banking, Housing and Urban Affairs.

11. OTA defense industry work was used in rewriting S.1379.

12. ISC work on counter-terrorism influenced HR5200 and S2822 as well as legislation appropriating funds for the Interagency Technical Support Working Group, which co-ordinates R&D related to countering terrorism.

13. Round Trip to Orbit noted that NASA had never reached its estimated space shuttle launch rate, and found that goal to be unrealistic. The conference report accompanying NASA 1991 appropriations requires that the space station design be based on "a realistic shuttle launch rate".

14. The following legislation concerns the DOE nuclear weapons production facilities. ISC Staff Paper Review of the Department of Energy Modernization Plan: Issues Surrounding the Proposed Termination, Relocation and Cosolidation of Activities at Certain Facilities in the Department of Energy Nuclear Weapons Complex, was the first product of OTA's assessment of the clean-up of the DOE weapons facilities. HR 765, HR 2707, HR 3065/S 1462, S 1304, S 1802, S2171/HR 4739, HR5015, HR5019, S972.

15. ISC space transportaion project reports analyzed topics relevant to HR 2674 (Space Transportation Services Act), HR 3729/S.916 (NASA Authorization 1990), HR4196/S2287 (NASA Authorization 1991).

16. Congress acted to raise the compensation for governemnt executives and other hard-to-fill positions. Holding the Edge discussed the problems of retaining scientists and engineers at defense laboratories. In addition, HR 5211 and S 2775 concerned personnel issues raised and analyzed in Holding the Edge.

17. Testimony on Patents in Space (House Judiciary, 10/4/89) included analysis of an earlier ISC paper "Space Stations and the Law".

10.5. Changes in Prior Plans for FY 1990 for the Energy, Materials, and International Security Division

During Fiscal Year 1990, the Energy, Materials, and International Security Division essentially accomplished its goals, with approved modifications and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 23 for the breakdown of the differences in estimated and actual Division spending for FY 1990.)

10.6. FY 1991 and FY 1992 Priorities for the Energy, Materials, and International Security Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Energy, Materials, and International Security Division may be asked to undertake in Fiscal Years 1991 and 1992. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Energy and Materials

Review of DOE's National Energy Strategy
The Department of Energy (DOE) is now working on a Nationa Energy Strategy (NES), and anticipates release of the final report in December 1990. A preliminary report was released early in 1990. However, this report was primarily a compilation of testimony from a series of public hearings. The report chronicles various perspectives on (1) increasing energy efficiency, (2) securing future energy supplies, and (3) environmental quality, but offers no comprehensive strategic framework. This final report is expected to provide an overview of past federal energy policies and to set a direction for future national energy strategies. This project would respond to a number of Congressional Committee's interest in an objective evaluation of the technological forecasts, analysis, and policy opportunities included in the NES.

Nuclear Power Plant Decommissioning and Life Extension
Over 25% of all U.S. nuclear power plants will reach the end of their design lives during the next 15 years. Decisions will have to be made, starting relatively soon, on whether to decommission them or make the necessary investments to extend their lifetimes. In some cases the decision will be easy, especially when the plant has been operating poorly or has been shut down for major safety inadequacies. Some plants, however, have been great economic assets, and there will be strong incentives to keep them operating. This study will examine the technologies involved in decommissioning and life extension; evaluate the implications for safety, costs, and electric power generation; and define the public policy decisions that will have to be made.

Social Costs of Energy Consumption
A common complaint of energy policymakers is that they are forced to make policy choices about energy systems without a clear understanding of the comparative social costs focused primarily on human health impacts, especialy injuries, illneses, and fatalities. Other costs, generally left out of these analyses, include an array of ecosystem effects, employment impacts, landuse impacts, aesthetic changes, and others. Also, costs can include distributive impacts, e.g. inter- and intra-regional shifts in jobs, changes in income distribution, and so forth. In this study, OTA would examine and review past attempts at establishing such methods and create a framework under which a credible method appropriate to U.S. policymaking could be constructed.

11.3. Role of the Health and Life Sciences Division

The Health and Life Sciences Division comprises 3 programs: Biological Applications; Food and Renewable Resources; and Health.

The Biological Applications Program assesses state-of-the-art technologies arising from the cutting edge of biological science. Its broader responsibility is to help Congress understand complex technologies in biomedical sciences. Early warning is very much a part of the Program's charter, and some studies explore potential future applications of biological technologies, in particular, for example, biotechnology and the new genetics. Because many of these new technologies have potential impacts that are of great social and political significance, ethical analysis is often a component of the assessments conducted by the Program.

The scope of the Food and Renewable Resources Program includes all agriculture-related technologies used to provide society with food, fiber, and chemicals, and technologies that enhance or jeopardize the ability to sustain in perpetuity the renewable resource bases that make such production possible. Agriculture itself is defined in the broad sense, including all crop and livestock production and forestry. Attention also is given to the impact that technology has had and is likely to have on how the agricultural system is organized, who controls it, and where it is heading. Further, the Program covers renewable resources that presently may not be considered or produced as crops, but that support such production and are fundamental to human needs. Relevant international analyses are often carried out.

The charter of the Health Program, the analysis of technological applications that affect human health, is reflected in three primary types of efforts: 1) assessments of clinical and general health care technologies and related policy areas; 2) assessments in the area of environmental and occupational health; and 3) collaboration with, and assistance to, other Programs on health-related issues in projects. The relationship of health care technology to financing, organization, and systems issues is a growing area of Program activity due to increased and focused Congressional interest. The Program's responsibilities include mandated reviews of protocols for health studies of Vietnam Veterans and of health effects among military personnel exposed to atomic bomb tests.

11.4. Accomplishments of the Health and Life Sciences Division

In FY 1990, the Health and Life Sciences Division published 6 assessment reports:

- Neurotoxicity: Identifying and Controlling Poisons of the Nervous System
- Beneath the Bottom Line: Agricultural Approaches to Reduce Agrichemical Contamination of Groundwater
- Genetic Witness: Forensic Uses of DNA
- Confused Minds, Burdened Families: Helping People Find Care for Those With Alzheimer's and Other Dementia
- Health Care in Rural America
- Unconventional Cancer Treatment

The Division also produced 7 special reports and 4 background papers:

- Rural Emergency Medical Services (Special Report)
- Preventive Services for Medicare Beneficiaries: Policy & Research Issues (Special Report)
- Agricultural Research and Technology Transfer Policies for the 1990s (Special Report)
- Indian Adolescent Mental Health (Special Report)
- Recombinant Erythropoietin: Payment Options for Medicare (Special Report)
- Forest Service Planning: Setting Strategic Direction Under RPA (Special Report)
- A Plague of Locusts (Special Report)
- The Costs and Effectiveness of Cervical Cancer Screening in Elderly Women
- The Effectiveness of Drug Abuse Treatment: Implications for Controlling AIDS/HIV Infection
- OTA Review of Report to Secretary of Department of Veteran's Affairs on Association Between Adverse Health Effects and Exposure to Agent Orange
- Costs and Effectiveness of Colorectal Cancer Screening in the Elderly

In addition, the Division produced 6 staff papers, and testified 12 times.

Listed below are several examples of direct legislative use of the Division's work:

Biological Applications

1. Genetic Witness - H.R. 5862 (Horton R-NY): A bill to amend Title I of the the Omnibus Crime Control and Safe Streets Act of 1968 to authorize funds received by states and units of local government to be expended to acquire laboratory equipment and computer software to improve the quality and accessibility of DNA analyses; and for other purposes [essentially a bill to require proficiency testing and to establish standards.] H.Con.Res. 385 (Horton R-NY): (similar to H.R. 5862). Background materials were supplied in advance of the report to the Senate Subcommittee on the Constitution (Simon D-IL) and the House Subcommittee on Civil and Constitutional Rights (Edwards D-CA) to assist their preparation of hearings on DNA typing on 3/15/89 and 3/22/89. Simon also subsequently worked to double the FBI's training programs and chartered the FBI's DNA databanking system.

2. Confused Minds, Burdened Families - The House Select Committee on Aging is using the report's findings about service use and service needs of people with dementia in the development of long-term care legislation for submission in the next session. The Subcommittee on Aging of the Senate Committee on Labor and Human Resources and the Subcommittee on Human Services of the House Select Committee on Aging are using the report's findings about Area Agencies on Aging to develop legislative proposals for the reauthorization of the Older Americans Act in the next session. Staff of the Subcommittee on Human Services is considering holding a hearing on the information and referral programs of Area Agencies on Aging that would include testimony based on the findings of the OTA report. Based on information developed for this report, OTA prepared a staff paper on case management for the Pepper Commission. The OTA staff paper was used as background for the Pepper Commission's recommendations for long-term care reform and is included in the commission's background papers.

3. New Developments in Biotechnology - OTA report New Developments in Biotechnology: Patenting Life used by House Judiciary Subcommittee on Courts, Intellectual Property, and Administration of Justice in consideration of legislation on patenting of animals and human beings, and in drafting the House report.

Food and Renewable Resources

1. The Senate Appropriations Committee used OTA's draft findings regarding grasshopper and locust control for their FY 1991 report on funding for the Agency for International Development (USAID), especially its Office of Foreign Disaster Assistance.

2. The summary of Beneath the Bottom Line: Agricultural Approaches to Reduce Agrichemical Contamination of Groundwater provided background material for the debate over water quality provisions for the 1990 Farm Bill.

3. The Senate Appropriations Committee included all of the options in A Plague of Locusts in their report on FY 1992 funding for USAID.

4. The Senate Committee on Agriculture, Nutrition and Forestry and the House Committee on Agriculture used the following reports in debating the 1990 Farm Bill:

- **Enhancing the Quality of U.S. Grain for International Trade** - The Report was used extensively in drafting the Grain Quality Title of the 1990 Farm Bill. Major areas of emphasis included changes in price support provisions, use of seed variety in the marketing of grain, and standardization of inspection technology.

- **Agricultural Research and Technology Transfer Policies for the 1990s** - In amending the Research, Teaching and Extension Title of the 1990 Farm Bill the Committees used findings and policy options from the report in a) changing the objectives, criteria and composition of the boards that advise USDA on research priorities; b) changing the emphasis in research funding mechanisms; and c) authorizing competitive grants for the Extension Service for technology transfer.

- **New Industrial Crops and Uses of Tranditional Crops (Draft Report)** - The Committees used the major findings and policy options from the report in drafting the Industrial Crops Title of the 1990 Farm Bill. The report assisted the Committees in identifying specific crops that have industrial use potential, establishing the need for flexibility in commodity price support programs so farmers have an incentive to grow these crops, and determining the role of the public sector in assisting the commercialization of these crops.

- **Impact of Bovine Somatotropin on the U.S. Dairy Industry (Draft Report)** - Major findings and policy options from the report were used by the Committees in amending the Dairy Title of the 1990 Farm Bill. The report assisted the committees in determining the specific price support program to authorize to minimize government expenditures and still to provide a safety net to the industry given the tremendous potential impact of this new technology.

5. Congressman Saxton will reintroduce H.R. 5852 related to exotic species. His staff has had discussions with OTA and may use OTA's on-going activities on exotic species to help in the Bill preparation.

Health

1. In 1979, Congress mandated, in P.L. 96-151, a study of any health effects on Vietnam veterans caused by possible exposures to dioxin in the defoliant Agent Orange. That same law mandated that no study could go forward without the research protocols being approved by OTA. Neither the Veterans Administration nor the Centers for Disease Control was able to design a study of exposures that OTA felt was adequate, and that portion of the protocol was not approved. OTA informed the relevant committees of Congress that the study should not go forward in its then planned form. Eventually the Agent Orange study was terminated. According to a recent General Accounting Office study, the amount that CDC returned to the U.S. Treasury, instead of using it on a scientifically infeasible study, was $14.3 million.

2. OTA's report, Rural Emergency Medical Services, was requested by numerous Congressional offices working on various emergency medical services bills (e.g., S.15, Emergency Medical Services and Trauma Care Improvement Act of 1989; H.R. 1587, Rural Emergency Medical Services Improvement Act of 1989; H.R. 1602, Trauma Care Systems Planning and Development Act of 1989). We also provided copies of tables from that report, giving State data on various rural EMS topics, to the office of Sen. Paul Simon for background material for a press conference.

3. Policy options in the OTA report Health Care in Rural America were used in formulating provisions in OBRA 90 for an initiative at the Health Resources and Services Administration to fund outreach/network grants to a variety of rural health facilities.

4. Drafts of our study of the cost-effectiveness of pap smear screening in the elderly was provided to staff of the Energy and Commerce Committee and the Ways and Means Committee, at their requests, to assist them in devising a potential Medicare Pap smear benefit, subsequently enacted. We also provided briefings and memos on specific aspects of such screening.

5. OTA staff briefed staff of the Subcommittee on Health of the Ways and Means Committee regarding the cost-effectiveness of colorectal cancer screening in the elderly. We also prepared a briefing book for the subcommittee staff containing (then) preliminary results from OTA's cost analysis and review of the literature on effectiveness of colorectal cancer screening.

6. OTA provided a copy of a final draft chapter on AIDS and STDs (sexually transmitted diseases) to the Select Committee on Children, Youth, and Families as background for their September 1990 committee report.

7. The project director of OTA's assessment on Adolescent Health testified before the House Committee on Interior and Insular Affairs on Indian adolescent mental health issues and their relevance of S. 1270, which was being considered by the House.

9. The House and Senate Committees on Veterans Affairs are making use of OTA's report on Health Care in Rural America and on the Chartbook on the same topic. Also, Sen. Kassebaum's office requested more detailed information concerning the report's policy options regarding rural health professions training programs. Sen. Kennedy's National Health Service Corps bill (S. 2617) also used data from OTA's report on Health Care in Rural America.

10. OTA provided information from our own work (tables from our rural health report) as well as xeroxes of material by CRS in response to a request from the Republican Senatorial Committee.

11. Judy Wagner, a senior associate in the Health Program, briefed minority staff of the Senate Aging Committee on issues of drug cost containment and drug pricing, in preparation for hearings. She also provided briefing material on drug pricing and promotion to staff of the Senate Labor and Human Resources Committee.

11.5 Changes in Prior Plans for FY 1990 for the Health and Life Sciences Division

During Fiscal Year 1990, the Health and Life Sciences Division essentially accomplished its goals, with approved modification and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 23 for the breakdown of the differences in estimated and actual Division spending for FY 1990.)

11.6 FY 1991 and FY 1992 Priorities for the Health and Life Sciences Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Health and Life Sciences Division may be asked to undertake in Fiscal Years 1990 and 1991. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Biological Applications

Assumptions and Science in Assessing Cancer Risks
Almost a decade has passed since OTA published Assessment of Technologies for Determining Cancer Risks From the Environment. That assessment is best known for its estimates of the quantitative cancer risks from different parts of the environment, but it also codified the 1980 knowledge and assumptions about carcinogenic risk assessment. Now, despite 10 years of research efforts and much new information, those assumptions remain at the heart of the risk assessment process. It is timely for OTA to analyze those assumptions and assess which ones are and which ones are not congruent with current knowledge of carcinogenesis. This is likely to be a controversial assessment, and it will undoubtedly cross the line between science and the policy that governs risk assessment.

12.3 Role of the Science, Information, and Natural Resources Division

The Science, Information, and Natural Resources Division comprises 3 programs: Communication and Information Technologies; Oceans and Environment; and Science, Education, and Transportation.

The Communication and Information Technologies Program is concerned with technologies that create, read, store, manipulate, transmit, or display information. Primarily these are electronic technologies exemplified by computers and communications systems. The core responsibilities of the Program require monitoring the research and development of new information technologies and assessing the technological state of the art in these areas as well as trends in basic research and development. The Program also studies telecommunications regulation, information policy, and applications of information technology in the public sector.

The Oceans and Environment Program has responsibility for all ocean-related questions, including ocean resources and maritime policy, and for large-scale environmental issues, such as climate modification and water pollution. As a result of changing Congressional interest, the Program has developed capability for analyzing the difficult questions in which the overriding concern lies with the environmental effects of decisions. The work of the Program usually falls under one of five basic categories: federal services, natural resources, pollution control, marine industry, and large-scale environmental issues.

The Science, Education, and Transportation Program is responsible for work in the broad areas of science policy (basic research direction and resource allocation), education (in grade K through graduate school and programs for adults not based on job skills), and the more technology specific area of transportation. For purposes of Program development: (1) "science" includes issues surrounding the health of the scientific enterprise; (2) "education" refers to in-school and other methods, practices, and philosophy for people from early childhood through adult; and (3) "transportation" refers to all modes of transport - vehicular, rail, air, and water.

12.4 Accomplishments of the Science, Information, and Natural Resources Division

In FY 1990, the Science, Information, and Natural Resources Division published 5 assessment reports:

- Copyright and Home Copying: Technology Challenges the Law
- Facing America's Trash: What Next for Municipal Solid Waste
- Partnerships Under Pressure: Managing Low-Level Radioactive Waste
- Critical Connections: Communication for the Future
- Electronic Bulls and Bears: U.S. Securities Markets and Information Technology

The Division also published 4 special reports, 5 background papers:

- Linking for Learning: A New Course for Education (Special Report)
- Rebuilding the Foundations: State and Local Public Works Financing and Management (Special Report)
- Helping America Compete: The Role of Federal Scientific & Technical Information (Special Report)
- Use of Integrity Tests for Pre-Employment Screening (Special Report)
- High Performance Computing and Networking for Science
- Computer Software and Intellectual Property
- Coping With an Oiled Sea: An Analysis of Oil Spill Response Technologies!
- Big Picture: HDTV and High-Resolution Systems
- Trading Around the Clock: Global Securities Markets and Information Technology

In addition, the Division prepared 3 staff papers and testified 21 times.

Listed below are several examples of direct legislative use of the Division's work:

Communication and Information Technologies

1. The report on Copyright and Home Copying: Technology Challenges the Law was cited and discussed by witnesses at Senate Hearing on legislation to require use of Serial Copy Management System in digital audio tape recorders.

2. At the request of the Senate Agricultural Committee, OTA commented on the sections of the telecommunications/Information Technology provisions of the House and Senate Rural Development Legislation. (S. 2830, Titled XX, and H.R. 3581, Titles XIX Through XVII.) The Conference Report on S. 2830, Food, Agriculture, Conservation, and Trade Act of 1990, makes referfence to OTA's comments.

Oceans and Environment

1. The findings of Facing America's Trash were referred to frequently in House and Committee hearings over proposed legislation on solid waste managment (e.g., H.R. 3735, S. 1112, S. 1113, H.R. 4942). OTA testified in 1989 on the first 3 bills, which are the primary committee vehicles for reauthorization of the Resource Conservation and Recovery Act. OTA testified in 1990 on H.R. 4942, concerning the role of the Department of Commerce in recycling. The report is cited frequently in ongoing staff discussions regarding potential source reduction and recycling provisions.

2. OTA testified on the findings of Wastes in Marine Environments at two hearings--one held by the House Committee on Public Works and Transportation on "Coastal Pollution Problems," one by the Senate Committee on Environment and Public Works on "Public Health and Marine Waters" (S. 2706). The OTA report also was a primary stimulus for a lengthy series of hearings held in 1987 to 1989 by the House Committee on Merchant Marine and Fisheries; OTA testified in 1987 and 1988. These hearings led to H.R. 2647, legislation on coastal pollution that passed the full committee this session. The findings of the report also were referred to in Senate hearings on marine research (S. 1178, S. 1179); this legislation reached the full Senate floor this session. OTA testified in 1988 and 1989 on these Senate bills.

Science, Education, and Transportation

1. OTA material provided the substance for the NSF appropriations hearing on science education. The Senate Appropriations Subcommittee for HUD-Independent Agencies built their questions on Educating Scientists and Engineers: Grade School to Grad School, and Senator Mikulski specified this document as her source during her questioning of NSF witnesses.

2. Educational technology studies led to provisions in the Teacher Education Bill (part of the Omnibus Education Act) to encourage teacher education for technology use. (The bill did not pass out of conference.) OTA work on science and engineering education, and on technology, were important to the "EMCEE" bill--Senator Kennedy's math/science initiative.

3. Performance Standards for Secondary School Vocational Education, resulted in inclusion of language in revisions to the Vocational Education Act on evaluation of various types of outcome measures for vocational education.

U.S. House of Representatives
Committee on Science
Hearing On
Scientific and Technical Advice to Congress

Witness:
Congressman Rush Holt

Questions For the Record

Appendix H

Office of Technology Assessment
Justification of Estimates
Submitted to the
Subcommittee on Legislative Branch Appropriations
1993

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Congress of the United States
Office of Technology Assessment

FISCAL YEAR 1993 JUSTIFICATION OF ESTIMATES

Not for distribution until after Hearings on Legislative Appropriations

Submitted to
SUBCOMMITTEE ON LEGISLATIVE BRANCH APPROPRIATIONS

December 1991

During the year, OTA served over 40 different Committees and Subcommittees of both houses, typically in response to bipartisan requests.

Relation of Work to Legislative Activities

OTA's role is neither to promote nor to discourage the development or the application of any particular technology or legislation but rather to help Congress determine whether or when some form of Federal government participation may make sense. OTA helps identify and clarify options; exposes misleading, unsupportable, or incorrect information; and helps raise the level of understanding in the debate about expensive and controversial technical issues.

In each section on accomplishments in OTA's divisions, we identify some activities during fiscal years 1991 and 1992 that illustrate the link between OTA's work and specific Congressional activity. Please see the following pages for this information:

page

Energy, Materials, and International Security Division
- Energy and Materials 38
- Industry, Technology, and Employment 39
- International Security and Commerce 41

Health and Life Sciences Division
- Biological Applications 56
- Food and Renewable Resources 56
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Science, Information, and Natural Resources Division
- Telecommunication and Computing Technologies 72
- Oceans and Environment 73
- Science, Education, and Transportation 73

Mandate Avoidance

OTA works closely with members of TAB and the Appropriations Committees to maintain the authority of the Board to determine the agenda of the agency and the best use of OTA's limited resources for the whole Congress. Because demand for OTA assistance exceeds the resources made available to the agency, some committees attempt to initiate studies through new legislation rather than request studies through the Board (as was contemplated in OTA's enabling legislation). Mandates are strongly discouraged as a mechanism to obtain OTA's help, and potential mandates are often avoided when we are able to work with the interested parties prior to introduction of bills. Nevertheless, during the 102nd Congress, a number of bills were introduced that would, if passed, mandate activities for OTA. For example:

H.R. 2508 — To amend the Foreign Assistance Act of 1961
Engrossed Senate Amendment issued on July 26, 1991; bill was in conference as of September 17, 1991

Expresses the sense of the Senate that OTA should undertake a detailed study of the process of formulation and the economic, social, and environmental impact of the programs of adjustment supported or leveraged by the Agency for International Development through the Development Fund for Africa.

H.R. 2854 — To provide for the labeling or marking of nontropical wood
Introduced July 10, 1991, and referred to the Committee on Energy and Commerce.

Would require OTA to report to Congress within a year of enactment on the countries that export nontropical wood and wood products to the U.S., the amounts exported, the uses of the products imported, and to make recommendations on the best methods for public disclosure of the data.

H.R. 2880 To amend the Solid Waste Disposal Act
Introduced July 11, 1991, and referred to the Committee on Energy and Commerce

Would require OTA to prepare within 18 months of enactment a study of all matters relating to the provision to the public of toxic release inventory information.

H.R. 3180 To amend title XVIII of the Social Security Act.
Introduced August 1, 1991, and referred to the Committees on Ways and Means and Energy and Commerce

Would require the Director of OTA to appoint the 13 members of a newly established Long-Term Care Advisory Council.

S. 12 To amend title VI of the Communications Act of 1934
Reported out of the Committee on Commerce, Science, and Transportation on June 28, 1991.

Would require an OTA participant on a study panel charged with making recommendations to Congress on developing, selecting, and funding programming for the public use channels required to be provided by any direct broadcast satellite service. The study would be due within 2 years of enactment.

S. 1567 To amend the Alzheimer's Disease and Related Dementias Services Research Act of 1986
Introduced July 26, 1991, and referred to the Committee on Labor and Human Resources

New Mandated Activities

New Mandated Study

Despite our best efforts to the contrary, OTA was mandated to do one study during the lst session of the 102nd Congress. The Defense Authorization Act, P.L. 102-190 raised the ceilings for independent research and development that is reimbursable by the Department of Defense. The Act requires OTA to evaluate these changes and to report to the Congress by December 1, 1995 to see if they have been effective in improving the nation's defense industrial base.

Other New Mandated Activity

P.L. 102-172, the Defense Appropriations Act, requires one small activity for OTA. The Secretary of Defense is required to "work with OTA" in a study that DoD is conducting on terrorism. However, OTA's role is consultative and will require minimal resources.

Existing Mandated Studies

OTA was able to successfully negotiate the study mandated by P.L. 101-574, the Small Business Reauthorization and Amendments Act. The act required a major review of the effects of all deregulation on rural America. The sponsors of the legislation graciously agreed to accept OTA's past work in the area as complying with the mandate, so minimal funds were expended on this mandate, and it is now considered completed.

OTA is currently conducting the study of handicapped access to inter city buses as required by P.L. 101-336. the American for Disabilities Act.

The other active mandate for a study occurred in the 100th Congress. P.L. 100-435, requires OTA to develop model performance standards, and review those actually developed by the Secretary of Agriculture, with regard to employment and training requirements within the food stamps program. A report to the Speaker, the President Pro Tempore, and the Secretary of Agriculture on the comparison/review is required. With the publication of the Department of Agriculture's standards in August 1991, OTA's report is due to the Congress at the end of February 1992.

OTA continues to have the ongoing activity of monitoring veterans studies (P.L. 96-151) which mandates that OTA monitor and evaluate certain studies by the Department of Veterans Affairs. OTA's initial work led to additional mandates: P.L. 98-169 requires that OTA monitor certain Federal research activities with regard to veterans exposed to atomic radiation; P.L. 99-272 requires that OTA monitor certain Federal research activities with regard to women veterans.

Other Mandated Functions

OTA has also been assigned the task of appointing health-related commissions. P.L. 99-660 mandated the OTA Director to appoint a citizens' Advisory Panel on Alzheimer's Disease. This mandate does not include any reporting requirements for OTA. However, OTA is required to appoint and monitor the activities of two additional commissions (see below).

Prospective Payment Assessment Commission (ProPAC)

The Commission is an independent advisory committee mandated under the "Social Security Amendments of 1983" (Public Law 98-21, Section 601) that reform the Medicare program payment method.

Under the Statute, the OTA Director is charged with selecting the Commission members. The first Commissioners were appointed in 1983. Six Commissioners' terms expired in March 1990, and the Director made three reappointments and three new appointments.

Physician Payment Review Commission (PhysPRC)

The Physician Payment Review Commission is also an independent advisory committee mandated under the Consolidated Omnibus Budget Reconciliation Act of 1985 (P.L. 99-272). PhysPRC's purpose is to advise Congress and the Executive Branch on possible ways of reforming physician payment under the Medicare program.

As with ProPAC, the OTA Director is statutorily charged with selecting the Commission members. Initial appointments to the 13-member Commission were made in 1986, for terms ranging from one to three years. In April of 1990, the Director reappointed three Commissioners and appointed two new Commissioners.

Interagency Coordination

In carrying out OTA's mission as a shared resource to the committees of the Congress, our staff cooperate and interact extensively not only with Congressional Members and staff, but also with staffs of other Federal agencies, as well as with the private sector and universities around the world. This extensive networking not only serves to avoid duplication but also helps to increase Congress' analytical resource base and enables OTA to utilize the most up-to-date information available. As a consequence, a typical OTA assessment, costing $500,000, draws heavily upon the work of others that, taken together, would cost many times more.

Over the past several years, OTA and the three other Congressional support agencies have adopted a process to more fully utilize each other's expertise. This is as true in administrative areas as program areas; for instance, the Library of Congress provides accounting and disbursing services to OTA on a reimbursable basis, CRS provides access to the SCORPIO database and other research assistance, and GAO provides legal advice and opinions. The Comptroller General and the Director of CRS serve on OTA's Technology Assessment Advisory Council, and agency directors meet regularly to discuss issues of common concern. CBO, CRS, and GAO staffs coordinate with, and, in some cases, participate in OTA advisory panel meetings, symposia, and workshops. The four agencies share information on related studies and provide new data as input to each others' projects as appropriate to their areas of expertise. In addition, two or more agencies may collaborate in the preparation of testimony or general assistance for Congressional hearings. Examples from 1991 include:

- As a follow-up to the reports, Energy Technology Choices: Shaping Our Future and U.S. Oil Import Vulnerability: The Technical Replacement Potential, and in conjunction with the ongoing project, U.S. Energy Efficiency: Past Trends and Future Opportunities, OTA staff cooperated with CRS's Environment and Natural Resource Policy Division to informally evaluate the implications of a variety of energy bills being considered by the Senate Committee on Energy and Natural Resources and the House Committee on Energy and Commerce at the request of both committees.

- In conjunction with preparation of the forthcoming report, Building Energy Efficiency, OTA has worked closely with the CRS Science Policy Research Division, which is examining various energy efficiency issues to help support the House Science, Space and Technology Committee's preparation of the energy R&D authorization legislation.

- In the course of the ongoing assessment Fueling Development: Energy and Technology in Developing Countries, OTA staff have coordinated with GAO staff who are engaged in a review of the U.S. Agency for International Development's energy programs. In the course of this work OTA staff also coordinated directly with U.S. AID and various offices of the Department of Energy's Trade and Development Program, the Department of Commerce, the Environmental Protection Agency, the Eximbank, OPIC, and the Department of the Treasury.

- In the course of completing OTA's report, Improving Automobile Fuel Economy: New Standards, New Approaches, OTA staff cooperated closely with DOE's Office of Policy, Planning and Analysis. Also in the course of this work, OTA staff provided detailed review of CBO staff memorandum on Corporate Average Fuel Economy (CAFE) incentives for sale of alternative fueled vehicles, which resulted in extensive changes in the CBO report. In this work and in the area of alternative fuels, OTA staff continue to cooperate closely with various CRS staff who are working on similar issues. OTA also is participating on the Electric Power Research Institute's advisory panel for its electric vehicle research program.

- In preparing the report, Energy Efficiency in the Federal Government, OTA worked closely with personnel from the Department of Defense, Postal Service, Department of Energy, General Services Administration, and Department of Veterans Affairs and Department of Housing and Urban Development. Since its publication, the report has been widely distributed by several Federal agencies in support of their in-house energy management activities. Private sector vendors of efficient products and services have used the report in their efforts to understand and overcome challenges they face in working with Federal agencies. The report has been widely cited as a balanced examination of the major issues and opportunities for improved Federal energy efficiency.

- In the course of our ongoing assessment Aging Nuclear Powerplants: Life Attainment, License Extension and Decommissioning, OTA has coordinated closely with U.S. General Accounting Office staff who have recently completed a study examining the U.S. Nuclear Regulatory Commission's research efforts for license extension.

- OTA's Background Paper Biological Effects of Power Frequency Electric and Magnetic Fields, continues to be widely cited as a landmark study and a balanced summary of the major issues in this controversial area. In response to a request from the Environmental Protection Agency OTA provided comments and suggestions for EPA's draft national research agenda on human exposure to electric and magnetic fields. OTA also continues informal consultation on these issues with other Federal and state agencies, including coordination with the GAO and CRS.

- As a follow-up to the OTA report, Physical Vulnerability of Electric Systems to Natural Disasters and Sabotage, OTA staff have assisted GAO staff who are planning an update of a report done about 1980 on Federal preparation for and responses to emergencies. They are using the OTA report in their analysis. The OTA report also was distributed by the Alaskan emergency planning agency and in a floor debate by the Alaskan legislature on whether the power system needed greater resistance. In the course of the original study, the U.S. Department of Energy's Office of Energy Emergencies cooperated closely with OTA. DOE was particularly helpful in securing difficult-to-locate information and in the national security review and classification of some of the more sensitive findings of the assessment. The cooperative relationship developed in the course of this assessment has led in part to the continued extensive use of the OTA report by DOE, GAO, the Federal Bureau of Investigation and other public and private institutions in their current activities in this area.

- The Federal Energy Regulatory Commission (FERC), many State Public Utility Commissions, the Electric Power Research Institute, and a wide range of other public and private institutions refer frequently in their current activities to OTA's assessment report, Electric Power Wheeling and Dealing: Technological Consideration for Increasing Competition. OTA continues to participate in review activities with these institutions based on the findings of the assessment.

- Over the last year, as in past years, the National Research Council (NRC) and the National Materials Advisory Board (NMAB) have been carrying out several major studies that follow up on recent OTA energy assessments. This year, these were in areas of automotive fuel economy, alternative fuels, nuclear power, industrial energy efficiency, and energy use in developing countries. OTA staff have been fully involved in these efforts and in many cases providing briefings on the OTA assessments in the course of the NRC and NMAB studies.

- OTA assisted GAO by providing them with contacts in semiconductors, computers and supercomputers for their study for Sen. Bentsen on on U.S. firms' difficulties in getting the latest equipment, components and materials from Japanese suppliers.

- EPA's National Advisory Council on Environmental Technology & Policy (NACEPT) has selected two themes for its future work: pollution prevention and trade & the environment. At its semi-annual meeting in Washington, NACEPT xeroxed and handed out copies of the Summary of OTA's Serious Waste Reduction.

- OTA staff have coordinated extensively with CRS during the planning phase of its assessment on U.S.-Mexico Trade and Investment.

- OTA collaborated with the Center for International Research, U.S. Bureau of the Census to explore the potential contribution of population growth to future global commercial energy consumption.

- The DOE Office of Industrial Technologies asked OTA to review the Department's Program Plan for their new Industrial Waste Reduction Program. The Plan contains many references to OTA's Serious Waste Reduction and adopts the OTA defintion of waste reduction.

- OTA provided information on the U.S. environment industry and U.S./Soviet trade in environmental goods and services to CEQ, to assist them in preparing environmental information for the Bush/Gorbechev Summit meeting in February 1991.

- OTA briefed the Acting Deputy Assistant Secretary of the Office of Aerospace at the Department of Commerce and some of her staff on our aircraft-related trip work for Competing Economies. This briefing was relevant to the ongoing negotiations between the U.S. and the European governments involved in Airbus over the subsidy issue.

- OTA analysts working on the aircraft case study for Competing Economies met with GAO's NASA study team within the National Security and International Affairs division. The NASA team is beginning a survey of NASA's aeronautics program, the contributions that NASA facilities and NASA R&D make to aviation in general and it's affects on U.S. industrial competitiveness. OTA briefed them on our visits to NASA Centers and NASA Headquarters and discussed our thinking for the NASA section in the aircraft industry chapter.

- At a meeting of the National Coalition on Advanced Manufacturing (NACFAM) in the Russell Senate Office Building, OTA presented the results of its assessment report Worker Training. At that meeting, Department of Labor people told OTA that Worker Training was one of two reports (the other being America's Choice) that caused the DoL's Office of Work-Based Learning to change the way in which it thinks about its pilot projects and demonstrations on training. The Office now realizes that the broader context of management practicies, work organization changes, and technology changes has to be addressed. As a result, the Office issued an RFP to further address these interactions.

- OTA staff met with the Training Policy Subcommittee of the Federal Committee on Apprenticeship at the request of the Chairman of the Subcommittee. Based on the Worker Training report, OTA briefed this group representing labor, industry and education on comparative investments in training by German and U.S. employers, and the German apprenticeship system. They were interested in OTA's policy options to promote and expand apprenticeship, especially the 1% payroll levy, increasing the Bureau of Apprenticeship and Training's budget for promotion of apprenticeship, and technical assistance to small firms.

- OTA briefed the National Advisory Commission on Work Based Learning (including Governor McKernan of Maine) on Worker Training as the lead in overview discussion for the Commission's day long meeting on developing a national strategy for skills upgrading to recommend to the Secretary of Labor.

- OTA staff wrote a paper on future arms control options for a CRS Workshop to be held in January 1992.

- OTA staff provided background and contact names to a GAO researcher investigating arms control verification research.

- OTA's International Security and Commerce Program (ISC) receives roughly six co-ordinaton calls per week from the GAO, and occasional coordination call from CBO. All ISC projects are coordinated with the sister agencies before work begins. Staff helped GAO staff formulate their strategic plan for studies of Air Force topics.

- CBO, CRS, and GAO staff attended the workshop OTA held on orbiting space debris.

- At the request of staff of the Appropriations Committee, officials from NASA met with OTA staff to discuss possible directions for technology research and development related to the exploration of the planets. CBO and CRS staff attended the workshop organized by OTA on the potential for the use of robots to explore the Moon and Mars.

- OTA staff involved in the assessment *Police Body Armor Standards and Testing* discussed issues and options with the National Institute of Justice and with the National Institute for Standards and Technology's Office of Law-Enforcement Standards, both of which have privately expressed strong interest in considering OTA's forthcoming report in weighing proposed changes to the current standard.

- OTA staff delivered a talk to Pacific Airport Security Officials meeting organized by Federal Aviation Administration, Los Angeles, CA; October 1991.

- OTA staff spoke before the Committee on Commercial Aviation Security, National Materials Advisory Board, National Research Council, Irvine, CA; December 1991 concerning terrorist threats to aviation.

- OTA staff briefed the staff of the White House Office of Science and Technology Policy on the report entitled Redesigning Defense.

- An OTA staff person delivered the keynote address at an Executive Branch conference on industrial preparedness and reconstitution, sponsored by the Federal Emergency Management Agency.

- OTA staff spoke at a GAO meeting concerning analysis of the defense industrial base.

- OTA staff have participated on the Planning Task Force for the future U.S. Army industrial base.

- OTA staff have coordinated with GAO on a report on direct foreign investment in biotechnology.

- In conjunction with its upcoming report entitled Cystic Fibrosis: Implications for Population Carrier Screening, OTA staff have enjoyed ongoing and continuing cooperation with the (1) Ethical, Legal, Social, Implications Program, National Center for Human Genome Research, National Institutes of Health, (2) the Ethical, Legal, Social, Implications Program, National Center for Human Genome Research, U.S. Department of Energy, and (3) the U.S. Food & Drug Administration, Center for Devices & Radiation Health.

- OTA staff have held a series of meetings with GAO staff to coordinate the work being done by both agencies concerning the causes of substance abuse and addiction.

- U.S. Agency for International Development & DOS/INM--Coordination with and participation in AID and DOS/INM seminar on Alternative Development. OTA provided lists of potential speakers and participants for the seminar coordinators. During the seminar, OTA provided a briefing on the ongoing OTA *Agricultural Alternatives to Coca Production* study and suggested key issues for discussion relevant to alternative development in the Andean Nations. The seminar was conducted to assist DOS/AID in developing long-term plans for development activities in narcotics producing areas.

- CRS loaned a technical expert on forestry to OTA to direct an OTA assessment on forest planning. OTA had lost its project director just at the time the assessment had been approved by OTA's Technology Assessment Board. This loan worked out very well and resulted in a high quality assessment.

- U.S. Environmental Protection Agency--(EPA) provided the assistance of a senior staff member to assist in the OTA project on Agricultural Alternatives to Coca Production.

- OTA staff briefed the USDA Assistant Secretary for Commodity Programs on results of the OTA report U.S. Dairy Industry at a Crossroad: Biotechnology and Policy Choices.

- OTA staff briefed administrators of the Agricultural Research Service, Cooperative State Research Service and the Extension Service on findings of the OTA report Agricultural Commodities as Industrial Raw Materials.

- OTA staff met with GAO staff to discuss complementary studies (both requested by House Ways and Means) on the costs of health care in the United States in comparison with other countries. The two agencies will continue to cooperate and have agreed to share data whenever possible.

- OTA staff discussed dual, related requests to OTA and GAO from the Senate Veterans' Affairs Committee concerning problems with the 1985 National Academy of Sciences study of atomic veterans. OTA staff will attend the next meeting set up by the GAO team with the Defense Nuclear Agency to discuss the source of errors in identifying atomic veteran rosters for study.

- In the study of low-volume mammography facilities, OTA worked closely with GAO, which intends to use our Background Paper as the starting point for its related study. OTA also worked with staff of the Physician Payment Review Commission on this issue.

- GAO staff members came to OTA to discuss a study request they have received on case management for long-term care. GAO is in the process of deciding what to focus on in order to coordinate with OTA but not duplicate. OTA staff and GAO staff have continued coordinating in this area. CRS has just begun a case management study, and consulted numerous times with OTA before deciding what to study, again to coordinate and avoid duplication.

- OTA and GAO have had extensive contact for purposes of coordinating the two agencies' studies relating to the Oregon Medicaid Waiver Proposal. GAO was asked to evaluate current Medicaid managed care providers in Oregon, and OTA was asked to evaluate the potential impact of service prioritization on providers of health care (including managed care providers) in the State. Coordination involved discussion of potential overlap between OTA and GAO studies, delineation of the scope of the respective studies, and sharing of information that was of mutual interest.

- CBO shared cost materials on home intravenous drugs, from their analysis related to the former Catastrophic Act. OTA is now providing our newly developed information to CBO in return. CBO is costing out an immunosuppressive bill and need numbers of drug costs and transplant patients and U.S. immunosuppressive expenditures.

- OTA staff have provided materials and discussed our current AIDS work with the Acting Executive Director and the incoming Executive Director of the National Commission on AIDS.

- Staff of the Health Resources and Services Administration (HRSA) consulted with OTA staff about case management for long-term care. HRSA has a large, multi-year, Congressionally-mandated demonstration program/study on case-managed home health care. The Senate Finance Committee wanted a report on the findings of the program/study, and HRSA wanted to know what policy-related information about case management could be derived from the program/study that would be useful to Congress.

- The project director for OTA's study, Health Care in Rural America, presented a briefing on rural health policy data needs to the HHS Office of Rural Health Policy.

- OTA staff working on Oregon's Medicaid Waiver Proposal briefed an interagency HHS task force on Oregon's prioritized list.

- OTA is cooperating substantially with HHS on joint concerns with respect to technologies for detecting osteoporosis, particularly in sharing drafts.

- OTA has made presentations to and discussed findings and options from the report entitled Complex Cleanup with a number of agencies and advisory groups, including: the Secretary of Energy's Advisory Committee on Nuclear Facility Safety; The Secretary of Energy's Task Force on Public Trust; the National Academy of Sciences Board on Radioactive Waste Management; the Environmental, Safety and Health Branch of DOE; the Agency for Toxic Substances and Disease Registry of the Public Health Service; the Environmental Protection Agency; the Nuclear Regulatory Commission; and the Office of Management and Budget.

- OTA has coordinated with GAO, CRS, and CBO concerning the release of the report entitled Complex Cleanup and the possible implementation of some of the policy options from the OTA study. This coordination has included meetings with several GAO project groups working on topics covered by OTA, and suggestions for specific investigations these agencies could undertake to build on the OTA work.

- Numerous representatives of Federal agencies and Federal laboratories participated in workshops and reviewed input papers and draft chapters for OTA's global warming report, Changing by Degrees. These included Department of Energy, the Environmental Protection Administration, Agency for International Development, Department of State, Department of Treasury, Lawrence Berkeley Laboratory, Oak Ridge National Laboratory and Batelle.

- OTA conducted a formal DOE briefing, in conjunction with the Office of Conservation and Renewables, on the OTA report Changing by Degrees. In addition, two informal briefings were provided for DOE staff on various aspects of the computer modelling effort.

- A briefing on the report Changing by Degrees was conducted at the request of the Department of State and included key representatives from the Departments of Commerce, Energy and Treasury.

- Congressional Research Service provided review for three of the chapters in the report entitled Changing by Degrees and the Congressional Budget Office reviewed the assessments' cost assumptions.

- An OTA assessment published in 1988 that evaluated technologies to treat acid paper in books prompted the Library of Congress to ask OTA for assistance in technical evaluation of proposals from industry to deacidify the LC collection. OTA staff chaired the Source Selection Evaluation Board for this solicitation and offered other technical advice about these chemical processes and their effects throughout 1991.

- Continuing discussions between OTA staff and Department of Education staff in the Office of the Secretary, OERI, Adult and Vocational Education, Office of Special Education covered: 1) expansion of Star Schools programs, and 2) use of telecommunications to disseminate research findings, improve technical assistance for schools, and link the Department of Education reform initiatives.

- OTA staff also monitored and provided information for the educational efforts related to the Department of Commerce SCANS Commission (Secretary's Commission on Assessing National Skills) and the National Commission on Testing.

- OTA science policy staff reviewed the CBO draft study, Large Nondefense Projects in the Budget, 1980-1996 and assisted with the document. The CBO study was able to build upon OTA work. ("The Office of Technology Assessment, in its Federally Funded Research: Decisions for a Decade (May 1991), poses a set of more fundamental questions than those addressed in this report." CBO study, page 1.)

- GAO staff working on NSF in-house review issues (Ph.D. shortfall projections and peer review procedures) met with OTA staff for discussion and comparison of information.

- Office of Science and Technology Policy staff asked for a briefing by OTA staff following the publication of Federally-Funded Research. This briefing identified a number of helpful portions of the report that will assist OSTP in planning research strategies.

- OTA transportation staff worked closely with GAO and CRS transportation staff, exchanging information, reviewing documents, participating in workshops and generally providing mutual support for related studies, including studies on infrastructure, surface transportation policy and tiltrotor/magnetic levitation analysis. CBO staff was involved in infrastructure study.

- OTA staff has briefed Science, Technology, and the Constitution approximately six times for OMB/Federal Executive Center audiences, in all about 250 Federal executives.

- At its request, OTA staff sent the Senate Finance Committee (requestor of the planned international telecommunications assessment) a memo about meetings in Hungary with telecommunications company officials.

- Computer Software and Intellectual Property (ongoing): Throughout the study, OTA has maintained close contact with the American Law Division of CRS. The relevant ALD staffer, as well as staff contacts from the CRS Science Policy Research Division, were invited to all panel meetings and technology/legal workshops held during the course of the study; CRS staff served as reviewers for various drafts of the report. GAO and CBO staff were included on the project mailing list and were invited to all panel meetings and workshops. One of the CBO staff contacts provided review comments on the draft report.

- The OTA project staff had frequent telephone interactions and several meetings with staff members at the Copyright Office and the Patent and Trademark Office, who were invited to panel meetings and workshops. Staff contacts at other relevant agencies were established at the start of the study and were included on the project mailing list for notification of panel meetings and workshops. OTA staff interviewed some of these and many of the agency contacts were solicited as reviewers for the draft report. Individuals from the Copyright Office, the Library of Congress, Defense Advanced Research Project Agency, the Patent and Trademark Office, and the National Library of Medicine served as workshop participants.

- The Miniaturization Technologies study was an example of interagency coordination at OTA. In the data gathering phase of the study, a researcher from the National Institute of Standards and Technology was temporarily detailed to the project. He supplied data on manufacturing technologies, the electronics industry, and advancements in molecular scale technologies.

- OTA staff met with Library of Congress staff to discuss the Library's plans to develop a science data base, and provided them with information and contacts about existing databases and people interested in their development.

- CRS participated in OTA's study of automated firearm purchaser record checks by providing comments on review drafts; the U.S. Department of Justice extensively used OTA's report Automated Record Checks of Firearm Purchasers and background paper The FBI Fingerprint Identification Automation Program in developing plans and priorities for improving the nation's criminal record and identification system; the FBI Director cited both OTA documents as providing balanced, objective, and useful analysis and suggestions on Federal law enforcement agency firearm purchaser check and record improvement actions; the Chairman of the FBI's National Crime Information Center Advisory Policy Board cited both documents for making a useful contribution to state/local law enforcement firearm purchaser check and criminal history record and fingerprint identification improvement actions.

6. Changes in OTA's Prior Plans for FY 1991

During FY 1991, OTA essentially accomplished its goals, with approved modifications, negotiated reductions, and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to make adjustments, and also the fact that the agency must operate with a reduced level of resources.

The chart below shows the variations in actual obligations for the OTA divisions for FY 1991 from the planned obligations for FY 1991 provided on Schedule A in the FY 1992 budget justification. The chart on page 26 provides a summary by object class of projections and actual expenditures for FY 1991.

Changes in OTA's Prior Plans
($000)

	1991 (est.)	1991 actual	% change
Division A	4,582	4,652	1.53
Division B	4,470	4,581	2.48
Division C	4,532	4,279	(5.58)
Division G	5,973	5,994	0.35

10.3. Role of the Energy, Materials, and International Security Division

The Energy, Materials, and International Security Division is comprised of three Programs: Energy and Materials; Industry, Technology, and Employment; and International Security and Commerce.

The Energy and Materials Program is responsible for assisting the Congress in understanding the technological possibilities for developing our energy and materials resources and the consequences of these developments for society. In this way, the Program can help the Congress ensure rational resource development such that economic growth is maintained, undesirable side effects are kept to a minimum, and the resource base is sustained for future generations. The Program covers those technologies that concern the extraction, delivery, and use of energy and materials. Although primarily directed at domestic resources, the Program also is concerned with world markets and policies, including imports and exports of energy and materials.

The Industry, Technology, and Employment Program examines how technology affects the ability of U.S. industry to contribute to a healthy national economy. Its responsibilities include consideration of the competitiveness of U.S. industries in international markets, trade and economic development issues, the number and nature of employment opportunities, needs for worker education, training and retraining, and ways to ease adjustment in structural economic transitions. The ITE Program is concerned with the competitive position of both basic and new industries, with the development and dissemination of pre-competitive technologies, and with the quantity, nature, and quality of jobs including issues of training an retraining.

The International Security and Commerce Program deals with national security, space technology, international relations generally, and international technology transfers. The Program's work in national security includes an assessment of likely impacts of technological considerations on national security, which includes international stability, diplomacy, alliance relations, and arms control, as well as deterrence and defense. Assessment of defense industrial/technological base issues is an increasing part of ISC's work. The work on space technology involves a range of issues, such as space transportation, international cooperation and competition in civilian space activities, and space debris, in which technological progress, civilian exploration, commercial uses of space, and national security must be reconciled. ISC's work in technology transfer combines several perspectives: the national security and foreign policy considerations that lie behind export controls, a concern for the health and competitiveness of U.S. industry in international markets; and a concern for the objective of managing technology transfer in such a way as to contribute to favorable international economic development.

10.4. Accomplishments of the Energy, Materials, and International Security Division

In FY 1991, the Energy, Materials, and International Security Division published 11 assessment reports:

- Energy in Developing Countries
- Technology Against Terrorism
- Energy Efficiency in the Federal Government
- Global Arms Trade
- Redesigning Defense
- Exploring the Moon and Mars
- Energy Technology Choices: Shaping our Future
- Verification Technologies
- Competing Economies: America, Europe, and the Pacific Rim
- Improving Automobile Fuel Economy
- U.S. Oil Import Vulnerability

The Division also produced 3 background papers:

- American Military Power: Future Needs, Future Choices
- Orbiting Debris: A Space Environmental Problem
- Adjusting to a New Security Environment: The Defense Technology and Industrial Base Challenge

In addition, the Division testified 18 times and prepared 2 staff papers.

Listed below are several examples of direct legislative use of the Division's work:

Energy and Materials

1. OTA's report, Improving Automobile Fuel Economy: New Standards, New Approaches, was used extensively in the draft legislation on increasing Corporate Average Fuel Economy (CAFE) Standards being considered as an amendment to S. 1220, the National Energy Security Act of 1991. In the course of this work, OTA provided extensive briefings and testimony for the Senate Energy and Natural Resources Committee, the House Energy and Commerce Committee, the Senate Commerce, Science, and Transportation Committee. OTA staff also informally analyzed draft CAFE legislation for Senators Bryan, Johnston, and Gore and provided extensive briefings for Senators Johnston and Levin. Throughout the year, OTA staff briefed a wide range of Senate and House members and staff on alternative fuels and automotive fuel economy and other energy technology issues being addressed in the assessment and testified several times on these subjects. Several of OTA's options have provided middle ground in the debate over CAFE standards.

2. The Senate Committee on Government Affairs relied on the findings of the report Energy Efficiency in the Federal Government: Government by Good Example?, and OTA's assistance in developing S. 1040, the Government Energy Efficiency Act of 1991. OTA interacted with staff of the House Energy and Commerce Subcommittee on Energy and Power in development of the Federal energy portions of H.R. 776, the National Energy Efficiency Act of 1991. Throughout the year, OTA staff briefed Senate and House staff on prospects and policy options for improving Federal energy efficiency.

3. OTA's report, U.S. Oil Import Vulnerability: The Technical Replacement Capability, covers a broad range of technologies and policies for reducing the risks of dependence on oil imports. The report was released at a press conference of the Senate Committee on Energy and Natural Resources and was widely cited by Senators on both sides during the cloture debate on S. 1220, the National Energy Security Act of 1991. During the course of the study, OTA provided informal technical briefings for Senate and House committee staff on technologies and policy initiatives for reducing oil imports to assist them in drafting legislation.

4. The OTA reports, Energy Technology Choices: Shaping Our Future and U.S. Oil Import Vulnerability: The Technical Replacement Potential, and ongoing work being carried out under the project, *U.S. Energy Efficiency: Past Trends and Future Opportunities*, have all been used extensively in Senate Energy and Natural Resource and House Energy and Commerce Committee deliberations on national energy policy. OTA has also testified this year on the President's National Energy Strategy, modifying the Strategic Petroleum Reserve, and setting national energy policy goals, energy R&D, energy efficiency, and energy regulation based on these studies.

5. As a continued follow-up to the Report, Energy and Developing Countries, and in the course of the on-going preparation of the final report, Fueling Development: Energy and Technology in Developing Countries, OTA has provided background for legislation on foreign aid and trade policy related to energy technology through a series of briefings and testimony to Committee and Members' staff. These include a staff briefing organized by the Energy and Environmental Study Conference and testimony before the House Committee on Banking, Finance and Urban Affairs, Subcommittee on International Development, Trade, Finance, and Monetary Policy.

6. OTA's Background Paper Biological Effects of Power Frequency Electric and Magnetic Fields was cited in reference to increased research funding for EPA by Subcommittees of the House Committee on Science, Space, and Technology and in draft legislation to coordinate and expand Federal research efforts and public information programs relating to EMF. In addition OTA continues to respond to requests for information and advice on EMF issues from individual members' offices.

7. OTA's reports, New Electric Power Technologies: Problems and Prospects for the 1990s, Nuclear Power in an Age of Uncertainty, and Starpower: The U.S. and International Quest for Fusion Energy continue to be used widely by energy R&D authorizing committees as a reference source. In particular, these reports were referred to frequently in the House Committee on Science and Technology's Subcommittees on Energy and on Environment authorization hearings on the DOE R&D budget. In addition OTA staff were consulted frequently by Committee staff in the consideration of related bills being considered by the Senate Committee on Energy and Natural Resources and the House Committee on Energy and Power.

8. Based on work from the ongoing assessment, *Materials Technology: Integrating Environmental Goals with Product Design*, OTA staff have consulted frequently with the staff of the House Energy and Commerce Committee's Subcommittee on Transportation and Hazardous Materials as they have drafted legislation reauthorizing the Resource Conservation and Recovery Act (RCRA). OTA staff provided the Subcommittee with briefing materials on toxic use reduction, as well as a critique of their draft RCRA bill.

Industry, Technology, and Employment

1. Senator Kennedy, speaking of his The High Skills, Competitive Workforce Act of 1991 said: "...it also draws heavily on OTA's report Worker Training: Competing in the New International Economy, which provided a great deal of valuable information utilized in drafting the bill." Senator Kennedy also commended OTA staff: "In addition to the written report, the OTA staff has been enormously helpful throughout the many months in shaping the legislation." Worker Training's detailed analysis of a training levy -- including state implementation, and specification that the levy be used to support such activities as basic skills instruction -- and its findings about the benefits of melding technology diffusion with training are reflected in the bill. Worker Training's findings also support a number of other provisions of the Bill, e.g.: Labor Department grants to trade associations and other industry organizations and state agencies for employment-based training (Section 411(b); to make permanent the exemption from taxation of employer provided educational assistance (Section 424); and high skills training consortia (Section 601).

2. OTA's report Worker Training also contributed to the formulation of Congressman Grandy's apprenticeship bill. The report was liberally quoted at Ways and Means Committee competitiveness hearings.

3. OTA has extensively briefed Committee staff on the findings of Worker Training. In particular we have discussed with Senator Bingaman's office transfer of DoD training technology to the private sector and educational institutions. Although the 1992 Defense Authorization Act contains little on training, interest continues. Legislation is possible that would call for a National Commission, with DoD, DoL, DoC, DoEd and private sector/labor representation to (1) develop a list of ranked workforce skills needed in the private sector; (2) possibly undertake an inventory of training technology; and (3) identify DoD training technologies that might help achieve the critical skills. Interest also continues on policy alternatives for portable training approaches to reduce risks to employer investments in training, especially a pilot training consortia approach.

4. OTA staff assisted the Subcommittee on Oversight and Investigations of the House Committee on Energy and Commerce prepare for hearings on issues regarding domestic technology transfer, focussing on barriers to the successful transfer of taxpayer-funded technologies to U.S. industries for commercialization. OTA drew on its work in Making Things Better and its ongoing work on *Technology Opportunities in Economic Conversion* to help structure the hearings.

5. Elements of the 1992 National Defense Authorization Act reflect findings and options in Making Things Better (MTB). (1) The Act supports government -industry cooperation in drawing up "multi-year strategies" for supporting research and development in strategic and critical technologies -- the need for which was a key finding in MTB. (2) The Act creates a joint Defense Department/Commerce Department manufacturing extension program, authorized at $50 million (not funded), to assist small manufacturers through existing extension centers. The Act also authorized $50 million (not funded) to regional critical technology application centers, which will provide a range of technology services, particularly to small firms. A strong case was made for the importance of technology extension programs, and their severe underfunding was emphasized in MTB. (3) The Act estabishes a U.S.-Japan Management Training Program ($10 million) to teach U.S. managers and engineers Japanese and send them to Japanese research institutions. The Act also increased the authorization for MANTECH and authorized over $180 million for a university research initiative, with $50 million for science and engineering training (in addition to authorizing other money for science and mathematics education). The Act also authorized $30 million for a pilot mentor-firm/protege-firm program and authorized money to support computer-integrated manufacturing. These provisions are consonant with the importance placed on manufacturing education, technology diffusion to small and medium sized firms and advanced manufacturing technology development by MTB, and by the OTA Staff Paper U.S. Manufacturing Opportunities in Defense and Commercial Industries prepared for Senator Bingaman.

6. H.R. 1989, The American Technology Preeminence Act of 1991, authorized $100 million for the FY92 funding for NIST's Advanced Technology Program (ATP). Congress appropriated $47.4 million, up from the Administration request of $33.9 million. The growth of the ATP program is supported by the findings of Making Things Better and other OTA reports including Commercializing High Temperature Superconductivity on the importance of industry-government cooperation and cost-sharing in the development of pre-competitive, generic technologies.

7. H.R. 1989, the American Technology Preeminence Act of 1991 authorized an increase from $10 million to $15 million for NIST's Federal Manufacturing Technology Centers. The Senate bill (S. 1034) authorized $25 million. The purpose of the centers is to diffuse up-to-date technologies to small and medium sized manufacturers; five centers have been established, and a sixth will open soon. Again, the findings of Making Things Better strongly supported the need for increased technology extension and diffusion to small and medium sized firms. H.R. 1989 and S. 1034 also authorized increases (to $2 million and $2.5 million respectively) for NIST assistance to state technology extension programs.

8. The Foreign Critical Technology Monitoring and Assessment Act drew on a policy option presented in Commercializing High-Temperature Superconductivity to support the efforts of professional and trade societies to monitor Japanese technology. This was later included in the Defense Authorization Act.

International Security and Commerce

1. OTA provided a classified briefing on the OTA assessment *Technology to Counter Terrorism* in January 1991 to the Subcommittee on Terrorism, Narcotics, and International Operations of Senate Committee on Foreign Relations and the Senate Committee on Governmental Affairs in February 1991. The House Subcommittee on Oversight of the House Public Works and Transportation Committee was also briefed.

2. OTA staff briefed staff of the House Committee on Science, Space, and Technology on issues concerning space debris. OTA staff has also met several times with Committee staff to discuss possible hearings and oversight of legislative initiatives regarding reductions in the production of orbital debris. OTA also briefed the staff of the Senate Committee on Commerce, Science, and Transportation.

3. OTA staff briefed staff members of the Subcommittee on Veterans Affairs, Housing and Urban Development, and Independent Agencies of the Senate Committee on Apropriations on the issues concerning orbital space debris. They also briefed the House Subcommittee on Veterans Affairs, Housing and Urban Development, and Independent Agencies as well as staff members of the House Committee on Science, Space, and Technology and the Senate Committee on Commerce, Science, and Transportation.

4. Redesigning Defense is being used as the conceptual framework for a series of six hearings on the future of the U.S. defense industry being conducted by the House Armed Services Committee's Panel on the Structure of the U.S. Defense Industrial Base. This Panel anticipates developing new legislation for the industrial base.

5. OTA staff testified on DoD's Manufacturing Technology Program before the House Armed Services Committee's Panel on Future Uses of Manufacturing and Technology Resources, November 1, 1991.

6. OTA staff delivered testimony before the Senate Committee on Governmental Affairs and the Subcommittee on Terrorism, Narcotics and International Operations of the Senate Committee on Foreign Relations concerning terrorists threats to U.S. citizens and interests.

7. OTA staff briefed the staff of the Senate Select Committee on Intelligence for its deliberations regarding funding of R&D for countering terrorism.

8. Referring to Technology Against Terrorism, the Aviation Security Improvement Act mandated establishment of a FAA panel to review FAA's aviation security R&D as suggested by OTA.

11.3. Role of the Health and Life Sciences Division

The Health and Life Sciences Division is comprised of three programs: Biological Applications; Food and Renewable Resources; and Health.

The Biological Applications Program assesses state-of-the-art technologies arising from the cutting edge of biological science. Its broader responsibility is to help Congress understand complex technologies in biomedical sciences. Early warning is very much a part of the Program's charter, and some studies explore potential future applications of biological technologies; for example, biotechnology and the new genetics. Because many of these new technologies have potential impacts that are of great social and political significance, ethical analysis is often a component of the assessments conducted by the Program.

The scope of the Food and Renewable Resources Program includes all agriculture-related technologies used to provide society with food, fiber, and chemicals, and technologies that enhance or jeopardize the ability to sustain in perpetuity the renewable resource bases that make such production possible. Agriculture itself is defined in the broad sense, including all crop and livestock production and forestry. Attention also is given to the impact that technology has had and is likely to have on how the agricultural system is organized, who controls it, and where it is heading. Further, the Program covers renewable resources that presently may not be considered or produced as crops, but that support such production and are fundamental to human needs. Relevant international analyses are often carried out.

The Health Program analyzes technological applications that affect human health. The Program's work consists of three primary types of efforts: 1) assessments of clinical and general health care technologies and related policy areas; 2) assessments in the area of environmental and occupational health; and 3) collaboration with and assistance to other Programs on health-related issues and projects. The relationship of health care technology to financing, organization, and systems issues is a growing area of Program activity due to increased and focused Congressional interest. The Program's responsibilities include mandated reviews of protocols for health studies of Vietnam Veterans and of health effects among military personnel exposed to atomic bomb tests.

11.4. Accomplishments of the Health and Life Sciences Division

In FY 1991, the Health and Life Sciences Division published 8 assessment reports:

- Genetic Monitoring and Screening in the Workplace
- Beneath the Bottom Line: Agricultural Approaches to Reduce Agrichemical Contamination of Groundwater
- Adolescent Health
- U.S. Dairy Industry at a Crossroads: Biotechnology and Policy Choices
- Agricultural Commodities as Industrial Raw Materials
- Outpatient Immunosuppressive Drugs Under Medicare
- Biological Rhythms: Implications for the Worker
- Biotechnology in a Global Economy

The Division also produced 1 special report and 7 background papers:

- Neural Grafting: Repairing the Brain and the Spinal Cord (SR)
- Children's Dental Services Under the Medicaid Program
- Identifying and Controlling Immunotoxic Substances

- Review of the Blue Cross and Blue Shield Association's Recommendations for Screening Guidelines and Insurance Coverage of Adult Preventive Health Services
- New Opportunities for U.S. Universities in Development Assistance
- Medical Monitoring and Screening in the Workplace: Results of a Survey
- HIV in the Health Care Workplace
- Dioxin Treatment Technologies

In addition, the Division testified 10 times.

Listed below are several examples of direct legislative use of the Division's work:

Biological Applications

1. OTA staff testified at a House Judiciary Subcommittee on Intellectual Property hearing on patents and biotechnology and the House Science Subcommittee on Environment hearing on commercial development of biotechnology in agriculture, chemicals, and environmental applications.

2. H.R. 3088/S.1355 addresses the issue of quality assurance for crime laboratories conducting forensic DNA analysis and establishes parameters for the FBI's creation of a DNA computer index. Both standards for quality assurance and DNA databanking were identified as policy issues by OTA, and both bills draw on OTA's analysis as set forth in OTA's report entitled Genetic Witness: Forensic Uses of DNA Tests. H.R. 3088, as reported by the Committee on the Judiciary, was included in the House version of the Omnibus Crime Bill (H.R. 3371), which was subsequently vetoed.

3. The House Labor-HHS Appropriations Subcommittee used the OTA projections from the 1988 report Mapping Our Genes--The Genome Projects: How Big, How Fast? as well as an informal OTA review during consideration of the budget plan for the Human Genome Project submitted by the National Center for Human Genome Research, National Institutes of Health.

4. The OTA report Neural Grafting: Repairing the Brain and Spinal Cord and additional information requested of OTA staff were used in consideration of H.R.2507, A bill to amend the Public Health Service Act to revise and extend the programs of the National Institutes of Health.

5. Noncancer Health Risks in the Environment, Identifying and Controlling Immunotoxic Substances, was released at a hearing on lawncare pesticides held by the Subcommittee on Toxic Substances, Environmental Oversight, Research and Development of the Senate Committee on Environment and Public Works on May 9, 1991. OTA's Director testified during that hearing.

Food and Renewable Resources

1. The OTA Report Beneath the Bottom Line: Agricultural Approaches to Reduce Agrichemical Contamination of Groundwater was used to support development of several programs in the 1990 Farm Bill, including the "Water Quality Incentives Program" that encourages farmers to keep chemical use records and develop plans to reduce potential groundwater contamination. The Senate Committee on Agriculture, Nutrition, and Forestry is using the report to develop further legislation related to nitrate contamination of groundwater.

2. The House Foreign Affairs Committee is using the OTA Background Paper New Opportunities for U.S. Universities in Development Assistance--Agriculture, Natural Resources, and Environment to assist them in rewriting the Foreign Assistance Act.

3. The House Committee on Post Office and Civil Service conducted a hearing on Forest Resource Management and Personnel Practices: Values in Conflict, on October 4th, 1990. OTA staff presented the statement "Forest Service Strategic Direction Under RPA: Implications for Managers" using information from the first OTA report on Forest Service planning.

4. The Senate Committee on Agriculture, Nutrition, and Forestry and the House Committee on Agriculture used OTA's report Agricultural Commodities as Industrial Raw Materials in oversight of the research and technology transfer activities of the USDA on traditional and new crops for industrial use.

5. The Senate Committee on Agriculture, Nutrition, and Forestry and the House Committee on Agriculture conducted hearings based on the results of the OTA report U.S.Dairy Industry at a Crossroad: Biotechnology and Policy Choices. It was subsequently used in drafting legislation to change the dairy price support program and supply management programs for the dairy industry

6. Non-Indigenous Species in the U.S. - Congressman Saxton has a continuing interest in non-indigenous species introductions. His staff consulted with OTA prior to holding hearings on this issue and while drafting a related bill. They plan to use the OTA non-indigenous species assessment in developing future legislation.

Health

1. OTA staff briefed approximately 35 staff from the Senate Rural Health Caucus and approximately 40 staff of House Rural Health Care Coalition on the findings and options of the OTA report, Health Care in Rural America.

2. The project director for Health Care in Rural America briefed 40 Energy & Commerce Committee staff and others on problems and potentials of rural health programs within the jurisdiction of the committee.

3. The bill reauthorizing the National Health Service Corps contained language and data from the OTA's Health Care in Rural America. A later version of the bill was enacted in November of 1990 (P.L. 101-597, The National Health Service Corps Reauthorization Act of 1990).

4. The project director for OTA's project on the Oregon Medicaid Waiver Proposal briefed a group of requesting and other House staffers on preliminary OTA findings from that project. Senate Finance Committee staff was briefed separately on the same topic.

5. The project director and staff from OTA's *Adolescent Health* project briefed staff of the Senate Subcommittee on Government Information and Regulation on the topic of adolescent delinquency and the juvenile justice system

6. The House Select Committee on Children, Youth and Families cited and used data from OTA's Adolescent Health report in a hearing on children's mental health issues. That Committee is also citing heavily from OTA's report in a Committee report entitled AIDS, Sexually Transmitted Diseases, and Children.

7. The Ways and Means Committee used data on the costs of neonatal intensive care and of low birthweight infants from OTA's Healthy Children report in the preparation of maternal and child health legislation.

8. OTA staff provided information and advice to Senate Finance Committee staff and staff to Sen. Harkin regarding a Medicare prevention bill and alternative prevention services for Medicare.

9. Public Law 101-555, a telecommunications authorization law, draws from policy options in the OTA report Health Care in Rural America in directing the Secretary of Commerce, in conjunction with the Secretary of HHS, to establish an advisory panel to develop recommendations regarding improving rural health care through information and telecommunications systems.

10. Cong. English used OTA's report on rural definitions to clarify the definitions in a bill that will require the Public Health Service to include urban/rural differences in their chartbook on health status.

11. OTA staff was asked to provide a written review for the Congressional Caucus for Women's Issues of a report issued by the National Institute on Aging concerning the Baltimore Longitudinal Study of Aging.

12. OTA staff provided information and ideas for hearing issues and witnesses for a hearing on women's health issues to the Subcommittee on Housing and Consumer Interests of the House Select Committee on Aging in the areas of osteoporosis and estrogen replacement therapy. Subsequently, the Subcommittee decided to prepare a Committee print on women's health and requested and used OTA information about osteoporosis for the print.

13. Ways and Means Committee staff participated in OTA's 1991 workshop on case management for long-term care. The project director for OTA's case management study met with staff of the House Select Committee on Aging to talk about the case management component of a long term care bill they were considering developing.

14. The project director for OTA's study on Special Care Units for People with Dementia briefed Rep. Snowe's staff and staff of the Alzheimer's Association on the study. The project director also met with staff of the Subcommittee on Aging of the Senate Committee on Labor and Human Resources to talk about several pieces of legislation and a proposed hearing. OTA provided information about research issues for special care units, as well as the legislative implications of OTA's Confused Minds, Burdened Families report.

11.5 Changes in Prior Plans for FY 1991 for the Health and Life Sciences Division

During Fiscal Year 1991, the Health and Life Sciences Division essentially accomplished its goals, with approved modification and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 21 for the breakdown of the differences in estimated and actual Division spending for FY 1991.)

12.3 Role of the Science, Information, and Natural Resources Division

The Science, Information, and Natural Resources Division is comprised of three programs: Telecommunication and Computing Technologies; Oceans and Environment; and Science, Education, and Transportation.

The Telecommunication and Computing Technologies Program is concerned with technologies that create, read, store, manipulate, transmit, or display information. Primarily these are electronic technologies exemplified by computers and communications systems. The core responsibilities of the Program require monitoring the research and development of new information technologies and assessing the technological state of the art in these areas as well as trends in basic research and development. The Program also studies telecommunications regulation, information policy, and applications of information technology in the public sector.

The Oceans and Environment Program has responsibility for all ocean-related questions, including ocean resources and maritime policy, and for large-scale environmental issues, such as climate modification and water pollution. As a result of changing Congressional interest, the Program has developed capability for analyzing the difficult questions in which the overriding concern lies with the environmental effects of decisions. The work of the Program usually falls under one of five basic categories: Federal services, natural resources, pollution control, marine industry, and large-scale environmental issues.

The Science, Education, and Transportation Program is responsible for work on a variety of topics, ranging from the traditional technology assessment issue of transportation to the newer issues of science policy and education. Science policy considers the health of the U.S. scientific enterprise, as well as allocation and decision-methods available to the Congress to support and manage research. Education work concentrates on schools but includes non-school delivery systems as well, and normally focuses on the use of technology to enhance learning.

12.4 Accomplishments of the Science, Information, and Natural Resources Division

In FY 1991, the Science, Information, and Natural Resources Division published 10 assessment reports:

- Changing by Degrees: Steps to Reduce Greenhouse Gases
- Complex Cleanup: The Environmental Legacy of Nuclear Weapons Production
- Finding the Rx for Managing Medical Waste
- Federally Funded Research: Decisions for a Decade
- Delivering the Goods: Public Works Technologies, Management and Financing
- Rural America at the Crossroads: Networking for the Future
- Moving Ahead: 1991 Surface Transportation Legislation
- Automated Record Checks of Firearm Purchases: Issues and Options
- New Ways: Tiltrotor Aircraft and Magnetically Levitated Trains
- Miniaturization Technologies

The Division also published 5 background papers:

- Seeking Solutions: High Performance Computing for Science
- Long-Lived Legacy: Managing High-Level and Transuranic Waste at the DOE Nuclear Weapons Complex
- The 1992 World Administrative Radio Conference (WARC 92): Issues for U.S. International Spectrum Policy
- The FBI Fingerprint Identification Automation Program: Issues and Options
- Bioremediation for Marine Oil Spills

In addition, the Division testified 19 times.

Listed below are several examples of direct legislative use of the Division's work:

Telecommunication and Computing Technologies

1. The House Judiciary Committee, Subcommittee on Civil and Constitutional Rights, used OTA testimony, OTA participation in meetings of the FBI's NCUIC Advisory Policy Board, and OTA's Background Paper The FBI Fingerprint Identification Automation Program as bases for conducting oversight of the FBI's identification automation program. The House and Senate Appropriations Committee staffs used OTA workshop results as input to FY 1992 appropriations and oversight decisions for the FBI fingerprint identification automation program. The House and Senate used the draft OTA report on Automated Record Checks of Firearm Purchasers in formulating legislation on firearms purchaser waiting periods and record checks. The Senate-passed version of the waiting period/record check provisions, subsequently agreed to by Senate-House Conferees, reflected consideration of several key points from the OTA report. Final Congressional action on crime legislation, which includes the firearms provisions, is still pending.

2. The 1989 report on Copyright and Home Copying: Technology Challenges the Law was cited at Senate hearings concerning the establishment of royalties on digital audio recorders and blank digital media.

3. OTA testified before the Subcommittee on Government Information, Justice, and Agriculture, about the security and survivability of the public switched telephone network. The OTA study Critical Connections is being used by the Subcommittee to develop legislation relating to the FCC's role in assuring the survivability of the public switched network. OTA also discussed this testimony and the conclusions in Critical Connections with staff from the House Subcommittee on Telecommunications and Finance, who are also developing legislation to assure the survivability of the network.

4. At the request of the Senate Agricultural Committee, OTA commented on sections of the Telecommunications/Information Technology provisions of the House and Senate Rural Development Legislation. (S. 2830, Titled XX, and H.R. 3581, Titles XIX Through XVII) The Conference Report on S. 2830, Food, Agriculture, Conservation, and Trade Act of 1990, makes reference to OTA's comments.

5. At the request of the House Agriculture Subcommittee on Conservation, Credit, and Rural Development, OTA testified on the proposed legislation, "Rural Electrification Administration Lending Assistance Improvements Act of 1991," which constituted the Administration's proposal for amendments to the Rural Electrification Act of 1936. OTA's testimony was used to justify continued financial support to the REA.

6. At the request of the Senate Committee on Small Business, OTA provided an analysis of the impact of telecommunication deregulation on rural businesses. This analysis, which was mandated last year, informed the issues laid out in the Small Business Reauthorization and Amendments Act (P.L. 101-574).

Oceans and Environment

1. Following release of Complex Cleanup, OTA testified before the House Committee on Science, Space, and Technology, the House Committee on Armed Services and the Senate Committee on Armed Services, which requested the study. The Senate Armed Services' hearings were designed specifically to receive findings and policy options developed by OTA. The Department of Energy, the Environmental Protection Agency and industry also testified and were asked to respond to the OTA report.

2. At a hearing before the Senate Committee on Government Affairs, Senator Tim Wirth presented the findings from the OTA report Complex Cleanup and asked DOE witnesses to respond.

3. The OTA report Complex Cleanup was used in developing such legislative proposals as the Federal Facilities Compliance Act and measures incorporated into the DOD budget authorization act. In addition, OTA made presentations on its report to a number of Congressional staff, committee staff and individual Members, some of whom used the information in considering budgets, legislation and oversight.

4. More than 150 Bills dealing with some aspect of climate change have been introduced in this Congress. Most seek to reduce CO2 emissions; some design research programs to better characterize effects of climatic change. The OTA report Changing by Degrees has been used in numerous hearings to argue either that CO2 emissions growth can be slowed or absolute reductions can be achieved. Our cost estimates have been used to show the expense of such emission reductions are highly uncertain, ranging from zero to as much as $150 billion.

5. OTA staff involved in global warming testified to Congress on four occasions: before the House Energy and Commerce Committee and before the Senate Environment and Public Works Committee on the whole assessment; before the House Energy and Commerce Committee as to how the assessment relates to Energy bill considerations; and before the House Science and Technology Committee in comparing global warming studies by OTA, the National Academy of Sciences and the National Academy of Engineering.

Science, Education, and Transportation

1. OTA knowledge of distance learning and technology in schools was utilized, both through testimony and work with Congressional staff, to craft revisions of the Star Schools program, which provides electronic learning for school consortiums.

2. OTA assisted House Committee staff in preparing language for the Department of Defense authorization bill regarding cooperation between Defense and the Department of Education in technologies.

3. OTA's Power On! and Linking for Learning studies were used by House Education and Labor Committee staff in preparing the Neighborhood Schools Improvement Act (educational reform and restructuring).

4. The House Committee on Science, Space and Technology created a Task Force on the Health of Research. This Task Force is using OTA's Federally Funded Research report in drafting an agenda for hearings for the FY 93 authorization of NSF and NASA budgets, modification of the OSTP charter, science education at NSF, and guidelines for indirect cost recovery. OTA staff is assisting the Task Force in this effort.

5. OTA staff met with the Congressional Caucus on Women's Issues regarding a provision on women in the reauthorization of the Higher Education Act.

6. Budget Committee Staff met with OTA science policy staff to consider alternatives for research priorities, and the returns on Federal investment from research spending.

7. OTA transportation studies played a prominent role in legislative action in FY 1992. Delivering the Goods, (infrastructure technology, management and financing) provided background for legislation related to EPA's assistance to rural jurisdictions as well as major impetus for consideration of dramatically new surface transportation legislation. OTA staff provided primary testimony on the legislation.

8. Moving Ahead, a companion study to Delivering the Goods, was also an important legislative tool. Options outlined by OTA and included in the Surface Transportation Bill as passed include a traffic congestion relief program, provision to ease construction of toll roads via use of Federal funds, increased allocation for mass transit, and much greater flexibility for states in the provision of Federal dollars. Provisions concerning Longer Combination Vehicles (LCVs) were taken directly from Moving Ahead.

9. The analysis of funding and development issues for tiltrotor aircraft and magnetic levitation vehicles (New Ways) was valuable to the Senate Appropriations Committee in determining funding. Both testimony and staff briefings were provided. Bills calling for tax incentive financing for magnetic levitation vehicles and requiring the Secretary of Transportation to lead and coordinate Federal efforts in maglev and other high-speed rail reflect the influence of the report. A related bill would create a Civil Tiltrotor Development Advisory Committee.

12.5. Changes in Prior Plans for FY 1991 for the Science, Information, and Natural Resources Division

During Fiscal Year 1991, the Science, Information, and Natural Resources Division essentially accomplished its goals, with approved modifications and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 21 for the breakdown of the differences in estimated and actual Division spending for FY 1991.)

12.6. FY 1992 and FY 1993 Priorities for the Science, Information, and Natural Resources Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Science, Information, and Natural Resources Division may be asked to undertake in FY 1992 and FY 1993. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

U.S. House of Representatives
Committee on Science
Hearing On
Scientific and Technical Advice to Congress

Witness:
Congressman Rush Holt

Questions For the Record

Appendix I

Office of Technology Assessment
Justification of Estimates
Submitted to the
Subcommittee on Legislative Branch Appropriations
1994

Relevant Pages
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3. SUMMARY OF AGENCY REQUEST

Schedule D

Office of Technology Assessment
FY 1994 Budget Request

	Calculation of Base	
	Staff	Amount ($000)
Appropriation, 1993	143	21,025
Proposed Changes for FY 1994		
Mandatory Pay and Related Costs		1,194
Price Level Changes		226
Program Type Changes		
Legislation		
Workload		480
Equipment, Alterations, Maintenance, Repairs, Etc.		
Total Proposed Changes	0	1,900
FY 1994 Budget Request	143	22,925

4. Overview of OTA's Role

Technological capabilities will determine, in large part, whether America leads or follows other economically and scientifically powerful nations in the decades following the end of the Cold War. With 20 years' experience, OTA has the proven ability to assist Congress's deliberations on the Nation's vision of the future and to help link the science and technology enterprise to accomplishment of national goals.

The foremost goal of citizens and elected officials appears to be restoring the resilience and competitiveness of the U.S. economy. OTA studies such as *Competing Economies: America, Europe, and the Pacific Rim*, *U.S. - Mexico Trade: Pulling Together or Apart*, and *After the Cold War: Living with Lower Defense Spending* help put the Nation's economic problems in perspective and provide important technological guidance and options for policy makers. The 103rd Congress will undoubtedly pursue legislation to ensure improvements in the quality of life and human health. OTA's assessments on education, e.g., *Technologies for Adult Literacy*, and health, e.g., *Does Health Insurance Make a Difference?* and *Special Care Units for People with Alzheimer's and Other Dementias*, establish a factual basis and broad context for the debates. As Congress addresses the critical goals of personal, national, and international security, OTA's studies ranging from *Police Body Armor Standards and Testing* to *Building Future Security: Strategies for Restructuring the Defense Technology and Industrial Base* will provide essential grounding in basic technical knowledge and opportunities. Improved environmental quality and sustainable use of natural resources will likely remain high on Congress's agenda. The breadth and depth of OTA's publications in this area -- *Green Products By Design: Choices for a Cleaner Environment*, *Trade and Environment: Conflicts and Opportunities*, *Building Energy Efficiency*, *Forest Service Planning: Accommodating Uses, Producing Outputs, and Sustaining Ecosystems*, and *A New Technological Era for American Agriculture* to name just a few -- reflect committees' requests to OTA to develop analyses and options that can serve as a common resource to all of the Congress as its tries to resolve these issues.

OTA's work in FY 1994 will continue to reflect the explicit needs of the committees of jurisdiction. The bipartisan, bicameral Technology Assessment Board (TAB) will guide OTA's work with committees and shape the agency's agenda through the assessment proposal approval process. OTA serves as a shared resource for Congress, providing nonpartisan analysis of scientific and technological issues -- issues intrinsic to all important policy decisions -- in a cost effective way.

5. OTA's Accomplishments During Fiscal Year 1992

During FY 1992, OTA delivered 52 publications to Congress, including assessment reports, background papers, and administrative documents (see p. 71). As of September 30, 1992, 42 TAB-approved studies and 17 special responses were in progress. As an integral part of carrying out assessments, OTA also provided expert advice, briefings, testimony, and results of OTA assessments matched to the specific needs of the requesting committees and the congressional agenda (see p. 111).

OTA reports represent comprehensive synthesis and analysis on some of the most controversial and costly issues faced by Congress, covering, for example, maintaining a strong defense in the aftermath of the Cold War, developing global standards for high technology equipment, the research and development agenda of the pharmaceutical industry, and U.S. vulnerability to oil import disruptions. These studies directly reflect the expressed needs and priorities of committees of the House and Senate. During the year, OTA served over 80 different committees and subcommittees of both houses, typically in response to bipartisan requests.

Relation of Work to Legislative Activities

OTA's role is neither to promote nor to discourage the development or the application of any particular technology or legislation, but rather to help Congress determine whether or when some form of Federal government participation may make sense. OTA identifies and clarifies options; exposes misleading, unsupportable, or incorrect information; and works to raise the level of understanding in the debate about expensive and controversial technical issues.

In each section on accomplishments in OTA's divisions, we identify some activities during fiscal year 1992 that illustrate the link between OTA's work and specific congressional activity. Please see the following pages for this information:

page

Energy, Materials, and International Security Division
Energy and Materials 28
Industry, Technology, and Employment 29
International Security and Commerce 30
Health and Life Sciences Division
Biological Applications 42
Food and Renewable Resources 42
Health 43
Science, Information, and Natural Resources Division
Telecommunication and Computing Technologies 55
Oceans and Environment 55
Science, Education, and Transportation 56

Mandate Avoidance

OTA works closely with members of TAB and the Appropriations Committees to maintain the authority of TAB to set the agenda of the agency and the best use of OTA's limited resources for the whole Congress. Because demand for OTA's assistance exceeds the resources made available to the agency, some committees attempt to initiate studies through new legislation rather than request studies through the Board (as was contemplated in OTA's enabling legislation). Mandates are strongly discouraged as a mechanism to obtain OTA's help, and potential mandates are often avoided when we are able to work with the interested parties prior to passage of legislation into law.

More than 60 bills containing mandates for OTA were introduced in the 102d Congress. OTA's work with the committees prevented all but seven mandates from being enacted, and two of the enacted mandates acknowledge the need for TAB approval before resources are devoted to the mandated activity. The five enacted mandates that do not recognize TAB's authority are:

P.L. 102-172 **Defense Department Appropriations for FY 1992**
This law requires DoD to work with OTA in conducting an examination of Israeli antiterrorism technologies. This consultative effort is expected to require only minimal resources.

P.L. 102-190 **National Defense Authorization Act for Fiscal Years 1992 and 1993**
This law requires OTA to conduct a study to determine the effect of regulations issued by DoD on payment of costs of contractors for independent research and development and for bids and proposals. The regulations were to be issued by April 1, 1992, and OTA's study is due no later than December 1, 1995. This effort would require significant FY 1994 resources.

P.L. 102-325 **Higher Education Amendments of 1992**
This law requires the Secretary of Education to consult with OTA in conducting a study which will provide an assessment of the information currently collected on graduate education and will identify what additional information should be generated to guide the Department of Education in defining and executing its role in the support of graduate education. This consultative effort will require minor funding in FY 1994.

P.L. 102-429 **Export Enhancement Act of 1992**
This law establishes the John Heinz Competitive Excellence Award and requires OTA to evaluate candidates. If undertaken, it will represent a major drain on

resources in FY 1993 and FY 1994. As noted on page 2 the activity represents a potential drain of $339,000 in FY 1993 and FY 1994 on OTA's ability to initiate new work.

P.L. 102-507 **Alzheimer's Disease Research, Training, and Education Amendments of 1992**
This law extends OTA's requirement (first established by P.L. 99-660) to appoint members to the Advisory Panel on Alzheimer's Disease and make annual reports on the Panel's activities. This activity has been approved and will not require significant FY 1994 resources.

Continuing Mandated Functions

OTA's study on Intercity Bus Access for Individuals With Disabilities, mandated by P.L. 101-336, the American for Disabilities Act, is expected to be delivered to TAB in March 1993. It will have cost over $450,000 over fiscal years 1992 and 1993.

OTA continues to monitor veterans studies: P.L. 96-151 requires OTA to monitor and evaluate certain studies by the Department of Veterans Affairs; P.L. 98-160 requires OTA to monitor certain Federal research activities with regard to veterans exposed to atomic radiation; P.L. 99-272 requires OTA to monitor certain Federal research activities related to women veterans.

OTA continues to appoint the members of the Prospective Payment Assessment Commission (ProPAC) and the Physician Payment Review Commission (PhysPRC). ProPAC is an independent advisory committee mandated under the "Social Security Amendments of 1983" (P.L. 98-21, Section 601) that reform the Medicare program payment method. The law requires the OTA Director to select the Commission members. The first Commissioners were appointed in 1983. Six Commissioners' terms expired in March 1992, and the Director made four reappointments and two new appointments.

PhysPRC is also an independent advisory committee and was mandated by the Consolidated Omnibus Budget Reconciliation Act of 1985 (P.L. 99-272). PhysPRC's purpose is to advise Congress and the Executive Branch on possible ways of reforming physician payment under the Medicare program. The law requires the OTA Director to select the Commission members. Initial appointments to the 13-member Commission were made in 1986, for terms ranging from one to three years. In April of 1992, the Director reappointed three Commissioners and appointed two new Commissioners.

Interagency Coordination

In carrying out OTA's mission as a shared resource of the committees of the Congress, our staff cooperate and interact extensively with congressional members and staff and with the staffs of other Federal agencies, the private sector, and institutions around the world. This extensive networking serves to avoid duplication and to increase Congress's analytical resource base as it enables OTA to utilize the most up-to-date information available. In particular, OTA and the three other congressional support agencies have adopted processes that ensure fuller utilization of each other's expertise -- in administrative as well as substantive areas. Senior staff from OTA, CRS, CBO, and GAO meet regularly to discuss topics on which each agency works, such as trade, education, health care, energy, agriculture, environment, transportation, and defense, in order to eliminate duplication and ensure that resources are devoted to each facet of an issue. A few recent examples of OTA networking that resulted in notable benefits to the Federal, State, and local government include:

- GAO is using OTA's assessment of the defense industrial base in its assessment of multiproduct production. In addition, OTA staff are periodically requested to review GAO's strategic plans for examining Air Force and other defense programs.
- OTA's companion projects, *After the Cold War* and *Building Future Security*, have helped GAO staff with background information on issues of military base closure, military conversion in Eastern Europe, and a federal clearinghouse for state and local governments.
- Based on research done for *After the Cold War*, OTA staff have helped CBO staff develop research

methods for measuring the location of defense spending.

- o OTA conducted a symposium on testing and assessment for GAO's human resources/education staff.
- o OTA's 1992 report, *Outpatient Immunosuppressive Drugs under Medicare*, was used by CBO to help cost out a bill introduced in Congress on the topic.
- o CRS, GAO, the Health Resources and Services Administration (HRSA), and the Office of the Assistant Secretary for Planning and Evaluation of HHS (ASPE) have used the background materials and contractor document for OTA's first case management workshop in developing their research projects on case management. These agencies have adopted the operational definition of Case Management developed for OTA's study, and as a result, the findings of the various studies will address the same topic.
- o GAO and CBO have provided budget data to OTA for its analysis of Earth Observation Systems, and the three agencies work closely together with the congressional committees of jurisdiction.
- o Based on the OTA report *Performance Standards for the Food Stamp Employment and Training Program*, an OTA staff member was asked to be a member of a study group to assist HHS in setting performance standards for the JOBS program. HHS organizers distributed the OTA report to the group.
- o Based on the OTA reports *Making Things Better*, *Competing Economies*, and *Serious Reduction of Hazardous Waste*, OTA staff have assisted the New Mexico Manufacturing Productivity Center with information on what other states are doing in manufacturing modernization and in industrial hazardous waste reduction.
- o Based on the report *Competing Economies*, OTA staff have provided background material to the Bureau of Research and Policy of the New York State Department of Economic Development to help them prepare their statutorily required annual statewide economic development strategic plan.
- o The Department of Health and Human Services cited findings of OTA's report, *Evaluation of the Oregon Medicaid Proposal*, to support their widely publicized decision not to grant the State a Medicaid waiver. The State of Oregon cited some other findings of the same OTA report in rebuttal to the Administration's decision. The State has also been making some adjustments to its prioritized list based on OTA's critique of the list.
- o The National Institute on Disability Research and Rehabilitation used OTA's 1982 report on *Technology and Handicapped People* to frame a recent **Federal Register** notice concerning its research priorities in the area of evaluation of disability-related devices.
- o OTA staff met with officials of the Office of Science and Technology Policy (OSTP) to discuss OTA's study of DNA patenting and its role in fulfilling U.S. commitments in the issue area. As a result, rather than conduct its own study, OSTP is encouraging international institutions to cooperate with OTA's study.
- o The National Research Council (NRC) specifically undertook studies of automotive fuel economy and nuclear power to follow up on OTA assessment reports. OTA staff were fully involved in the NRC effort, often providing briefings on OTA's work.
- o The Department of Defense used OTA's study of the defense industrial base in developing their industrial base program.
- o Two OTA reports, *Redesigning Defense* and *Building Future Security*, have become textbooks at the Industrial College of the Armed Forces.
- o Officials responsible for development of standards for body armor in Canada and the United Kingdom delayed standard-setting in anticipation of OTA's report on the issue.
- o NASA's Earth Observing Systems program is carefully weighing one of the cost-reducing options outlined in OTA's background paper, *Affordable Spacecraft*: flying instruments individually (or in small groups) on separate spacecraft rather than flying them collectively on a larger spacecraft.
- o An OTA staffer member chaired an Expert Panel convened by an Interagency Task Force on Telecommunications in Education for OSTP.
- o The data analysis model from OTA's report, *Safe Skies*, was used as one guide in reorganizing FAA's Office of Aviation Safety.

10.3. Role of the Energy, Materials, and International Security Division

The Energy, Materials, and International Security Division comprises three Programs: Energy and Materials; Industry, Technology, and Employment; and International Security and Commerce.

The Energy and Materials Program is responsible for assisting the Congress in understanding the technological possibilities for developing our energy and materials resources and the consequences of these developments for society. In this way, the Program can help the Congress ensure rational resource development such that economic growth is maintained, undesirable side effects are kept to a minimum, and the resource base is sustained for future generations. The Program covers those technologies that concern the extraction, delivery, and use of energy and materials. Although primarily directed at domestic resources, the Program also is concerned with world markets and policies, including imports and exports of energy and materials.

The Industry, Technology, and Employment Program examines how technology affects the ability of U.S. industry to contribute to a healthy national economy. Its responsibilities include consideration of the competitiveness of U.S. industries in international markets, trade and economic development issues, the number and nature of employment opportunities, needs for worker education, training and retraining, and ways to ease adjustment in structural economic transitions. The ITE Program is concerned with the competitive position of both basic and new industries, with the development and dissemination of pre-competitive technologies, and with the quantity, nature, and quality of jobs.

The International Security and Commerce Program deals with national security, space technology, international relations generally, and international technology transfers. The Program's work in national security includes an assessment of likely impacts of technological considerations on national security, which includes international stability, diplomacy, alliance relations, and arms control, as well as deterrence and defense. Assessment of defense industrial/technological base issues is an increasing part of ISC's work. The work on space technology involves a range of issues, such as space transportation, international cooperation and competition in civilian space activities, and space debris, in which technological progress, civilian exploration, commercial uses of space, and national security must be reconciled. ISC's work in technology transfer combines several perspectives: the national security and foreign policy considerations that lie behind export controls, a concern for the health and competitiveness of U.S. industry in international markets; and a concern for the objective of managing technology transfer in such a way as to contribute to favorable international economic development.

10.4. Accomplishments of the Energy, Materials, and International Security Division

In FY 1992, the Energy, Materials, and International Security Division published 15 assessment reports:

- **U.S. Oil Import Vulnerability: The Technical Replacement Potential**
- **Improving Automobile Fuel Economy: New Standards, New Approaches**
- **Competing Economies: America, Europe and the Pacific Rim**
- **Performance Standards for the Food Stamp Employment and Training Program,**
- **After the Cold War: Living With Lower Defense Spending**
- **Technology Against Terrorism: Structuring Security**
- **Fueling Development: Energy Technologies for Developing Countries**
- **Building Energy Efficiency**
- **Retiring Old Cars: Programs to Save Gasoline and Reduce Emissions**
- **Building Future Security: Strategies for Restructuring the Defense Technology and Industrial Base**
- **Police Body Armor Standards and Testing**
- **Police Body Armor Standards and Testing: Vol. II**
- **Monitoring Limits on Sea-Launched Cruise Missiles**
- **Green Products by Design: Choices for a Cleaner Environment**
- **U.S. Mexico Trade: Pulling Together Or Pulling Apart?**

The Division also published 5 background papers:

- o **American Military Power: Future Needs, Future Choices**
- o **NASA's Office of Space Science and Applications: Process, Priorities and Goals**
- o **Trade and Environment: Conflicts and Opportunities**
- o **Lessons in Restructuring Defense Industry: The French Experience**
- o **Remotely Sensed Data From Space: Distribution, Pricing, and Applications**

In addition, the Division testified 14 times.

Listed below are several examples of direct legislative use of the Division's work:

Energy and Materials

1. Based on the findings of the reports *Energy Efficiency in the Federal Government: Government by Good Example?* and *Building Energy Efficiency*, OTA interacted extensively with the Senate Committee on Governmental Affairs, which led to Chairman Glenn's introduction of S. 1040, the Government Energy Efficiency Act of 1991. OTA interacted with staff of the House Energy and Commerce Subcommittee on Energy and Power in development of the Federal energy portions of H.R. 776, the National Energy Efficiency Act of 1992. Throughout the year, OTA staff briefed Senate and House staff on prospects and policy options for improving Federal energy efficiency. The report was cited heavily in the February Senate Floor debate over S. 2166, The National Energy Security Act of 1992. OTA's Staff Memorandum on "Opportunities for Compact Fluorescent Lamps in Federal Facilities," which was completed as a follow-up to the Federal energy efficiency report, was also cited extensively in the February Senate Floor debate over Federal energy provisions of S. 2166, and was inserted verbatim by Senator Glenn into the Congressional Record on February 6, 1992 (S. 1180-1181).

2. OTA's report, *Improving Automobile Fuel Economy: New Standards, New Approaches*, was used extensively throughout the 102nd Congress in the draft legislative proposals to increase Corporate Average Fuel Economy (CAFE) Standards, which were being considered as amendments to comprehensive energy legislation being debated in both the House and Senate (S. 2166, The National Energy Security Act of 1992 and H.R. 776, The National Energy Efficiency Act of 1992). In the course of this work, OTA provided extensive briefings and testimony for the Senate Committees on Energy and Natural Resources and on Commerce, Science, and Transportation, and the House Committee on Energy and Commerce. OTA staff also informally analyzed draft CAFE legislation for Senators Bryan, Johnston, and Gore and provided extensive briefings for Senators Johnston and Levin. Throughout the year, OTA staff briefed a wide range of Senate and House members and staff on alternative fuels and automotive fuel economy and other energy technology issues being addressed in the assessment and testified several times on these subjects in the last year. Several of the OTA options have provided middle ground in the debate over CAFE standards. OTA continues to be consulted frequently by Committee staff and Members on this topic.

3. OTA's report, *U.S. Oil Import Vulnerability: The Technical Replacement Capability*, was widely cited by Senators on both sides during the cloture debate on S. 1220, the National Energy Security Act of 1991 and in the subsequent February 1992 floor debate over the revised bill, S. 2166. During the course of the study, OTA provided informal technical briefings for Senate and House committee staff on technologies and policy initiatives for reducing oil imports to assist them in drafting legislation. Finally, the OTA report was also cited in Senate consideration of H.R. 776 the House version of the energy bill in August 1992. One of the report's policy options -- establishment of a process for setting clear national energy policy objectives with quantitative indicators of progress, and periodic review by Congress and the Executive Branch -- made its way into S. 1018, a bill to establish national energy policy goals, and H.R. 776 as amended by the Senate. OTA staff continue to respond to requests for information and clarification on the report and its subject matter for congressional staff.

4. Building on the findings of OTA work on the biological effects of electromagnetic fields completed in the course of the assessment, *Electric Power Wheeling and Dealing: Technological Considerations for Increasing Competition*, and the background paper, *Biological Effects of Electromagnetic Fields*, throughout the 102nd

Congress OTA staff were consulted by staff of the House Committee on Science, Space, and Technology as they drafted of legislation on federal research efforts on biological effects of electric and magnetic fields (EMF) and on the appropriate level, scope, and structure of federal research efforts.

5. As follow-up delivery of the Report, *Fueling Development: Energy Technologies for Developing Countries*, OTA provided background for legislation on foreign aid and trade policy related to energy technology through a series of briefings to Committee and Members' staff. These included a staff briefings with the House Committee on Banking, Finance and Urban Affairs, Subcommittee on International Development, Trade, Finance, and Monetary Policy. The report was used by Subcommittee staff in drafting in H.R. 3428, "The International Development, Trade, and Finance Act of 1991," to authorize U.S. capital contributions to a number of international financial institutions.

6. In the course of preparation of the report, *Green Products by Design: Choices for a Cleaner Environment*, OTA staff were consulted frequently by the staff of the House Energy and Commerce Committee's Subcommittee on Transportation and Hazardous Materials as they have drafted legislation reauthorizing the Resource Conservation and Recovery Act (RCRA). OTA staff provided the Subcommittee with briefing materials on toxic use reduction, as well as a critique of their draft RCRA bill. House Science, Space, and Technology Committee's Subcommittee on Environment convened a hearing shortly after the release of the report to consider R&D legislation.

7. In the course of preparing the report, *Retiring Old Cars: Programs to Save Gasoline and Reduce Emissions*, OTA staff were consulted by both House and Senate staff regarding legislative proposals aimed at removal of older cars from the U.S. fleet. The OTA work contributed to the analysis of costs and benefits of alternative legislative proposals, in particular legislation introduced by Sen. Roth. Building on the OTA analysis, OTA staff reviewed implementation problems associated with various options and the potential effects on oil use of the Senator's proposed legislation granting CAFE credits to automakers participating in retirement programs.

8. OTA's assessment report, *Electric Power Wheeling and Dealing: Technological Considerations for Increasing Competition*, was cited extensively in the early legislative discussions and hearings in the House Energy and Commerce Subcommittee on Energy and Power affecting the regulation of electric utilities such as proposals to amend the Public Utility Holding Company Act, the Public Utilities Regulatory Policy Act, and the Federal Power Act included in the House and Senate versions of comprehensive energy legislation considered in the 102nd Congress.

9. OTA's reports, *New Electric Power Technologies: Problems and Prospects for the 1990s*, *Nuclear Power in an Age of Uncertainty*, and *Starpower: The U.S. and International Quest for Fusion Energy* continue to be used by energy R&D authorizing committees as reference sources. In particular, they were referred to frequently in the House Committee on Science and Technology's Subcommittees on Energy and on Environment authorization hearings on the DOE R&D budget. In addition OTA staff were consulted frequently by Committee staff in the consideration of related bills being considered by the Senate Committee on Energy and Natural Resources and the House Subcommittee on Energy and Power.

Industry, Technology, and Employment

1. Based on research done for *Making Things Better* and *Competing Economies*, OTA was able to make substantial contributions -- briefings, consultations, and document reviews -- to development of the comprehensive legislation, the American Technology and Competitiveness Act of 1992 (H.R. 5100).

2. Frequent references to *Competing Economies* appear in both the Science, Space and Technology Committee's report to the Budget Committee on the 1993 budget and in Chairman Brown's remarks on the floor of the House. The Committee's report quotes and adopts OTA's conclusion on the future of U.S. competitiveness absent changes in government policies and draws from policy options in technology development, technology diffusion, trade, and taxes.

3. The report by the Committee on Government Operations on Japan's economic policy toward the high-performance computing industry extensively references *Competing Economies* on, among other topics, the technology of supercomputers, the policies of the Japanese government to develop Japan's supercomputer industry, and the Japanese response to the 1987 Supercomputer Agreement.

4. Since its release in February, *After the Cold War: Living with Lower Defense Spending* has received extraordinary Congressional attention. In particular, OTA has been consulted on an ongoing basis by the Senate Democratic Defense Conversion Task Force headed by Sen. Pryor (who calls OTA's assistance invaluable) and has briefed the Senate Republican Defense Conversion Task Force headed by Sen. Rudmann. One notable briefing included a talk given at the weekly luncheon of the Democratic Policy Committee, which was attended by some 40 members.

5. *After the Cold War: Living with Lower Defense Spending* was used intensively and had many impacts in the strategic framework of legislation and in specific provisions. Many of the options of the report became law -- especially in the area of investment for growth. The legislative vehicles were the Defense Authorization and Appropriations Acts. On the technology side, an outstanding feature of the law was an appropriation of $100 million for Federal support of state and local technology extension services open to all small and medium sized manufacturing firms -- not just defense firms.

6. In Introducing S.2554, the Technical Skills Enhancement Act, Senator Rockefeller stated, "The Office of Technology Assessment published an excellent report in 1990 on worker training [*Worker Training: Competing in the New International Economy*]. [The OTA] report takes an in-depth look at all the training issues, including technology transfer. The report states: 'State and Federal industrial extension services are slowly learning that small firms need more than just the latest hardware -- they need help in benefiting from the technology which includes training the workers...' My bill is a natural, next step in the direction suggested by OTA....."

The Technical Skills Enhancement Act draws upon Options in Worker Training, which suggest ways to combine training with technology transfer and industrial extension services, and discuss the need for a single clearinghouse to disseminate best practice information on training.

7. The analysis in *Worker Training* of the need for workforce training consortia and collection of data on training influenced provisions on these subjects in H.R. 3507, the proposed American Industrial Quality and Training Act.

8. In preparing S. 2633, introduced by Senator Dole in April 1992, the U.S. Department of Labor drew heavily on *Worker Training*. OTA's findings on the weaknesses of U.S. training relative to competitors such as Japan, Germany, Korea, and Canada were used to develop the bill's proposal for a comprehensive overhaul of the Federal-State employment and training system.

9. Based on the trade work OTA has done in *Competing Economies* and in *Trade and Environment*, OTA assisted staff of the Subcommittee on Fisheries and Wildlife Conservation and the Environment to understand the GATT implications of potential Administration legislation limiting wild bird imports that the Committee wanted, but that the Administration had put on hold because of potential GATT problems. The Committee decided to go ahead with its own legislation limiting imports. The legislation was passed (P.L. 102-440).

International Security and Commerce

1. OTA's study of the defense industrial base study had direct impact on S. 3114 and Conference Report H.R. 102-966 that became the Defense Authorization Act for FY93.

2. The Senate Foreign Relations Committee reprinted OTA briefing materials and the summary of *Verification Technologies: Measures for Monitoring Compliance with the START Treaty* in its START hearings prints.

3. OTA testified before the Senate Foreign Relations Committee on the relevance of *Verification Technologies: Cooperative Aerial Surveillance in International Agreements* to the Open Skies Treaty.

4. OTA's background paper, *Remotely Sensed Data from Space: Distribution, Pricing, and Applications*, focused on the different approaches to data pricing and distribution policies outlined in H.R. 3614, and S. 2297, bills to amend the Landsat Commercialization Act of 1984. It had a role in resolving differences, resulting in the passage of P.L. 102-555, the Land Remote Sensing Policy Act of 1992.

10.5. Changes in Prior Plans for FY 1992 for the Energy, Materials, and International Security Division

During Fiscal Year 1992, the Energy, Materials, and International Security Division essentially accomplished its goals, with approved modifications and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 12 for the breakdown of the differences in estimated and actual Division spending for FY 1992.)

10.6. FY 1993 and FY 1994 Priorities for the Energy, Materials, and International Security Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Energy, Materials, and International Security Division may be asked to undertake in Fiscal Years 1993 and 1994. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Energy and Materials

ENERGY RESEARCH AND DEVELOPMENT: RESPONDING TO CHANGING NEEDS

The Federal Government spends about 230 million dollars per year on energy efficiency R&D, and about 2650 million dollars per year on energy supply R&D. The energy efficiency research includes transportation, buildings, industry, and utilities. A rapidly changing external environment has shifted the efficiency-related R&D needs of the nation, but it is not at all clear that DOE's R&D planning methodology allows for these changes to be reflected in the R&D portfolio. In this project OTA will explore (1) how Congress and DOE allocates R&D funds both within sectors and across sectors, (2) alternative methods to allocate these funds (for example, by looking at how other R&D organizations allocate their funds), and (3) provide options to ensure that allocation of R&D funds can respond to changing national needs while still providing the long-term stability needed to bring technologies to commercial application.

SOCIAL COSTS OF ENERGY CONSUMPTION

Energy policymakers frequently make choices -- through R&D funding, tax policy, regulatory changes, etc. -- among energy systems without a clear understanding of their comparative overall social costs, especially those costs not captured in our current market economy. Decreasing energy security, faltering economic growth, and environmental degradation are making such a cost accounting ever more important if choices are to be made that are sensitive to externalities not captured in the market. In this study, OTA would examine and review past

11.3. Role of the Health and Life Sciences Division

The Health and Life Sciences Division comprises three programs: Biological Applications; Food and Renewable Resources; and Health.

The Biological Applications Program assesses state-of-the-art technologies arising from progress in biological science. Its broader responsibility is to help Congress understand complex technologies in biomedical and behavioral sciences. Early warning is very much a part of the Program's charter, and some studies explore potential future applications of biological technologies; for example, biotechnology and the new genetics. Because many of these new technologies have potential impacts that are of great social and political significance, ethical, legal, and regulatory analysis is often a component of the assessments conducted by the Program.

The scope of the Food and Renewable Resources Program includes all agriculture-related technologies used to provide society with food, fiber, and chemicals, and technologies that enhance or jeopardize the ability to sustain in perpetuity the renewable resource bases that make such production possible. Agriculture itself is defined in the broad sense, including all crop and livestock production and forestry. Attention also is given to the impact that technology has had and is likely to have on how the agricultural system is organized, who controls it, and where it is heading. Further, the Program covers renewable resources that presently may not be considered or produced as crops, but that support such production and are fundamental to human needs. Relevant international analyses are often carried out.

The Health Program's charter is reflected in two primary types of efforts: 1) assessments of specific clinical and general health care technologies, and 2) studies of broader issues of health policy related to or with implications for technology. In addition, it has certain statutory, methodology oversight responsibilities regarding Vietnam veterans health studies, and provides the staff work for the OTA Director's mandated responsibility to select and appoint members of the Prospective Payment Assessment Commission and the Physician Payment Review Commission.

11.4. Accomplishments of the Health and Life Sciences Division

In FY 1992, the Health and Life Sciences Division published 9 assessment reports:

- **Biotechnology in a Global Economy**
- **Volume II - Adolescent Health: Background and the Effectiveness of Selected Prevention and Treatment Services**
- **Forest Service Planning: Accommodating Uses, Producing Outputs, and Sustaining Ecosystems**
- **Evaluation of The Oregon Medicaid Proposal**
- **Home Drug Infusion Therapy Under Medicare**
- **Cystic Fibrosis and DNA Tests: Implications of Carrier Screening**
- **A New Technological Era for American Agriculture**
- **The Biology of Mental Disorders**
- **Special Care Units for People with Alzheimer's and Other Dementias: Consumer Education, Research, Regulatory and Reimbursement Issues**

The Division also produced 10 background papers:

- **Screening Mammography in Primary Care Settings: Implications for Cost, Access, and Quality**
- **Medical Monitoring and Screening in the Workplace: Results of a Survey**
- **HIV in the Health Care Workplace**

- **Review of a Protocol for a Study of Reproductive Health Outcomes Among Women Vietnam Veterans**
- **The Menopause, Hormone Therapy, and Women's Health**
- **Identifying and Controlling Pulmonary Toxicants**
- **CDC's Case Definition of AIDS: Implications of Proposed Revisions**
- **Do Medicaid and Medicare Patients Sue More Often Than Other Patients?**
- **Does Health Insurance Make a Difference?**
- **Difficult-to-Reuse Needles for the Prevention of HIV Infection Among Injecting Drug Users**

In addition, the Division testified 8 times.

Listed below are several examples of direct legislative use of the Division's work:

Biological Applications

1. The reports, *Genetic Witness: Forensic Uses of DNA Tests, Genetic Monitoring and Screening in the Workplace, Medical Monitoring and Screening in the Workplace--Results of a Survey*, and *Cystic Fibrosis and DNA Tests: Implications of Carrier Screening*, all contributed to report language related to NIH appropriations that suggests establishment of a genetic information and privacy commission.

2. On October 24, 1992, the President signed Public Law 102-493, the Fertility Clinic Success Rate and Certification Act of 1992, which had been introduced by Congressman Ron Wyden as H.R. 4773. The law calls for each clinic to report its success rates to the Department of Health and Human Services in two ways. One is the statistic proposed by the director of the OTA project that resulted in the May 1988 report *Infertility: Medical and Social Choices*; the other a more optimistic (but less realistic) statistic endorsed by the practitioners of the art.

3. Additional copies of OTA's *Neural Grafting* report were requested by the Senate subcommittee on Aging of the Senate Committee on Labor and Human Resources, for use in action on fetal tissue transplantation.

4. The Report *The Biology of Mental Disorders* was released at a hearing of the Senate Labor and Human Resources Committee. Following that hearing, the report was cited during the floor debate on the HHS appropriations bill in the Senate.

Food and Renewable Resources

1. The Report, *Agricultural Research and Technology Transfer Policies for the 1990s*, led to the creation of the Agriculture Science and Technology Review Board, an expansion of the Users Advisory Board, and the determination of research priorities in Title XVI of the Food, Agriculture, Conservation and Trade Act of 1990.

2. The 1991 report, *Agricultural Commodities as Industrial Raw Materials*, was instrumental in changing the thinking of Senate and House Appropriations Committees about the advisability of allocating large-scale funds to commercialization activities of traditional and new crops for industrial use by developing a number of commercialization centers.

3. The OTA report on *U.S. Dairy Industry at a Crossroads: Biotechnology and Policy Choices* was the basis of hearings conducted by the Senate Committee on Agriculture, Nutrition, and Forestry and the House Committee on Agriculture. The report was subsequently used in drafting and amending legislation to change the dairy price support program and supply management programs for the dairy industry.

4. The Report, *Forest Service Planning: Accommodating Uses, Producing Outputs, and Sustaining Ecosystems*, spurred development of a provision to the Interior Appropriations Act requiring the U.S. Forest Service to have and retain an administrative appeals process.

5. An updated release, *Combined Summaries--Technologies to Sustain Tropical Forest Resources and Biological Diversity*, was used as briefing material for the Congressional Delegation to the UN Conference on Environment and Development (the "Earth Summit") held June 1992 in Rio de Janeiro, Brazil.

6. The Program's most recent publication, *A New Technological Era For American Agriculture*, is expected to influence legislation related to : food safety, plant and animal protection, biotechnology regulations, and amendments to the Federal Insecticide, and Rodenticide Act.

Health

1. Programs to address several of the research, training, and education needs identified in our 1990 report, *Confused Minds, Burdened Families: Finding Help for People With Alzheimer's and Other Dementias*, have been mandated by P.L. 102-507, including research on the role of physicians in connecting people with dementia to appropriate services, training for information and referral and case management personnel, and educational grants to inform health care providers and families about the availability of services and funding for services for people with dementia.

2. The project director for OTA's **Prevention** series and other OTA staff (including OTA's Assistant Director, Health and Life Sciences) provided various committees of the House and Senate with briefings, materials, and advice regarding aspects of prevention. Numerous bills have been introduced that mandate OTA doing various things related to prevention (such as developing a process on how the decision process/standards of evidence/etc. for covering additional prevention technologies should be done). OTA also advised committees and individual Members on issues surrounding Medicare (and general) coverage of colorectal cancer, cervical cancer, etc. This advice and briefings grew out of work on our **Prevention** Series (screening for colorectal cancer, cholesterol, cervical cancer, glaucoma, and also policy and evaluation issues re: prevention).

3. OTA staff provided information, based on our Pharmaceutical R&D study and on specific spreadsheet analyses, to staff of Senators Kassebaum and Metzenbaum, regarding the implications of whether a $200 million or a $100 million limit should be placed on the amount of revenues an orphan drug can receive without losing its market exclusivity. OTA's analyses indicated the benefits of the higher limit.

4. OTA staff provided advice to staff of Congressman Mike Kopetski regarding potential financial and organizational impact of the Oregon Medicaid demonstration waiver on Federally Qualified Health Centers (FQHCs) and Federally certified rural health clinics (RHCs).

5. OTA's 3-volume report on *Adolescent Health* was used by Congress in drafting legislation relating to various aspects of adolescent health. Five bills with the potential to have a substantial impact on adolescent health passed (Preventive Health Amendments of 1992; ADAMHA Reorganization Act, 1992; Indian Health Care Amendments, 1992; Job Training Reform Amendments, 1992; Juvenile Justice and Delinquency Prevention Act,
1992).

The Juvenile Justice and Delinquency Prevention Act of 1992 made substantial amendments to a similarly-named act first passed in 1974, including amendments that would improve coordination among Federal, State, and local agencies and emphasize community-based programs and services, including family counseling and coordination of family services. The project director of the OTA Aolescent Health project provided advice to the staff person for the newly re-established Senate Judiciary Subcommittee on Juvenile Justice and Delinquency, on the development of this legislation.

OTA's *Adolescent Health* report was cited in hearings related to **prevention** (the House Select Committee on Children, Youth, and Families (May 1991); **healthcare reform** (the House Select Committee on Children, Youth, and Families (1992); and **comprehensive school-based health services** (Senate Committee on Labor and Human Resources;(July 1992). The OTA project director met with health staff of Senate Committee on Labor And Human Resources to discuss the revision and reintroduction of Sen. Kennedy 's bill on **comprehensive school-based health services.**

OTA's report was cited in a report on **Teens and AIDS** published by the House Select Committee on Children, Youth, and Families in May 1992. OTA was asked to review the draft of this report prior to publication .

11.5 Changes in Prior Plans for FY 1992 for the Health and Life Sciences Division

During Fiscal Year 1992, the Health and Life Sciences Division essentially accomplished its goals, with approved modification and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

(Please see the chart on page 12 for the breakdown of the differences in estimated and actual Division spending for FY 1992)

11.6 FY 1993 and FY 1994 Priorities for the Health and Life Sciences Division

A Division's work is determined by the expressed needs of Congressional Committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and Congressional Committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Health and Life Sciences Division may be asked to undertake in Fiscal Years 1993 and 1994. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Biological Applications

BIOLOGICAL PRIVACY

Our country's decision to map the human genome has opened wider the window of concern about what information about a person's biology deserves privacy. In a related area, the increased knowledge of the biological bases of mental illness will also raise questions about what kind of information about a person's biochemistry deserves privacy and what kind of information should be released to insurance carriers, law enforcement agencies, and other organizations that will argue that increased efficiency and safety will follow from their having that information. This assessment would delineate what information is now held private and which released, derive whatever lessons those decisions provide for dealing with the new privacy questions, and analyze the methods now being used to make privacy decisions related to new biological technologies. The introduction of bills about genetic privacy in the current Congress illuminates current interest in this area.

ORGAN TRANSPLANTATION: NEW TECHNOLOGIES, NEW ISSUES

Organ transplants are increasingly common surgical procedures; indeed, the limiting factor for some procedures is the availability of donor organs. This assessment would describe the improvements in

12.3 Role of the Science, Information, and Natural Resources Division

The Science, Information, and Natural Resources Division comprises three programs: Telecommunication and Computing Technologies; Oceans and Environment; and Science, Education, and Transportation.

The Telecommunication and Computing Technologies Program is concerned with technologies that create, read, store, manipulate, transmit, or display information. Primarily these are electronic technologies exemplified by computers and communications systems. The core responsibilities of the Program require monitoring the research and development of new information technologies and assessing the technological state of the art in these areas as well as trends in basic research and development. The Program also studies telecommunications regulation, information policy, and applications of information technology in the public sector.

The Oceans and Environment Program has responsibility for all ocean-related questions, including ocean resources and maritime policy, and for large-scale environmental issues, such as climate modification and water pollution. As a result of changing Congressional interest, the Program has developed capability for analyzing the difficult questions in which the overriding concern lies with the environmental effects of decisions. The work of the Program usually falls under one of five basic categories: Federal services, natural resources, pollution control, marine industry, and large-scale environmental issues.

The Science, Education, and Transportation Program is responsible for work on a variety of topics, ranging from the traditional technology assessment issue of transportation to the newer issues of science policy and education. Science policy considers the health of the U.S. scientific enterprise, as well as allocation and decision-methods available to the Congress to support and manage research. Education work concentrates on schools but includes non-school delivery systems as well, and normally focuses on the use of technology to enhance learning.

12.4 Accomplishments of the Science, Information, and Natural Resources Division

In FY 1992, the Science, Information, and Natural Resources Division published 5 assessment reports:

- **New Ways: Tiltrotor Aircraft and Magnetically Levitated Vehicles**
- **Miniaturization Technologies**
- **Testing in American Schools: Asking the Right Questions**
- **Global Standards: Building Blocks for the Future**
- **Finding A Balance: Computer Software, Intellectual Property and the Challenge of Technological Change**

The Division also published 6 background papers:

- **The 1992 World Administrative Radio Conference (WARC 1992): Issues for U.S. International Spectrum Policy**
- **The FBI Fingerprint Identification Automation Program: Issues and Options**
- **Dioxin Treatment Technologies**
- **Managing Industrial Solid Wastes from Manufacturing, Mining, Oil and Gas Production, and Utility Coal Combustion**
- **Alaskan Water for California? The Subsea Pipeline Option**
- **Disposal of Chemical Weapons: Alternative Technologies**

In addition, the Division testified 9 times.

Listed below are several examples of direct legislative use of the Division's work:

Telecommunication and Computing Technologies

1. The House Judiciary Committee, Subcommittee on Civil and Constitutional Rights, used the OTA report, *The FBI Fingerprint Identification Automation Program: Issues and Options*, as a basis for conducting oversight of the FBI's identification automation program.

.The House and Senate Appropriations Committee staffs used the report as input to FY94 appropriations and oversight decisions for the FBI fingerprint identification automation and revitalization program (including the Identification Division move to West Virginia).

2. The House and Senate used the OTA report, *Automated Record Checks of Firearm Purchasers: Issues and Options*, in analyzing legislation on firearms purchaser waiting periods and record checks. The crime legislation, which includes the firearms provisions, may be reintroduced in some form in the 103rd Congress.

3. The OTA reports, *Informing the Nation: Electronic Dissemination of Federal Information* and *Helping America Compete: The Role of Federal Scientific and Technical Information* were used in congressional formulation and consideration of S.1044, the "Federal Information Resources Management Act," S.1139, the "Paperwork Reduction Act of 1991," H.R.2772, the "GPO Wide Information Network for Data Online Act" and H.R. 3459, the "Improvement of Information Access Act." All of these bills failed of enactment in the 102nd Congress; some are likely to be reintroduced, perhaps in revised form, in the 103rd Congress.

4. The OTA report *Helping America Compete* was used in congressional formulation and consideration of the National Technical Information Service-related provisions of the "Technology Preeminence Act," that was enacted by the 102nd Congress.

Oceans and Environment

1. *Complex Cleanup*, which analyzed environmental remediation and waste management programs at the Department of Energy (DOE) nuclear weapons complex, led to a provision in the National Defense Authorization Act (NDAA) Conf. Rpt. 102-966 (Sec. 3103) of H.R. 5006 for Fiscal Year 1993 that requires DOE to prepare, with broad outside input, a report to Congress assessing the effectiveness of its citizen advisory groups and of methods of improving public participation in its environmental and waste management activities.

OTA's report, *Complex Cleanup* led to provisions in the Defense Authorization Act for FY92 that provided additional funding for ATSDR's health assessments at DOE sites, and expanded the authority of the Defense Nuclear Facilities Safety Board to include oversight over DOE's environmental remediation and waste management programs.

Complex Cleanup was the basis for a provision of the Senate-passed version of the Defense Authorization Act for FY93, S. 3114, Sec. 3119, that would have established at DOE nuclear weapons sites site-specific citizen advisory boards modeled on a policy option in the OTA report. *Complex Cleanup* was quoted in the Senate report in discussing the rationale for the provision.

Complex Cleanup was the basis for several House bills. After OTA staff briefed Rep. Richardson on the OTA report, he introduced the "Federal Facilities Community Oversight for Public Health Act of 1992" (H.R. 5121) that would have amended the Solid Waste Disposal Act to establish citizens advisory boards for each DOE nuclear weapons facilities, and to strengthen the role and capability of ATSDR to conduct health assessments at DOE facilities, and to involve the public in such assessments. The bill was referred to the Committee on Energy and Commerce. Briefings of committee staff also served as input to other legislation that would have amended Superfund legislation.

OTA staff provided technical information derived on *Complex Cleanup* for provisions incorporated into the Federal Facilities Compliance Act, S. 596, and H.R. 2194, enacted this session.

2. Following release of OTA's background paper, *Disposal of Chemical Weapons: Alternative Technologies*, and briefings of member staffs and committees, legislation was introduced in the Senate and House to create a mechanism to explore and develop alternative technologies and to require the Army to postpone construction of incinerators until alternative approaches were evaluated. The final defense budget legislation puts a hold on the Army's program, and eliminates $105 million for the Alabama incinerator until a review and report to Congress is completed at the end of 1993. Other results included state laws for more stringent emission limits on the chemical weapons incinerators and attention to local citizen group's concern by the Army and its advisors.

3. Many options developed by OTA *Changing By Degrees: Steps to Reduce Greenhouse Gases* were included in the Energy Bill. Continued support to the House and Senate Committees as they worked to develop a joint Energy Bill. About 15 measures described in the report are incorporated into the Bill.

Science, Education, and Transportation

1. The Chairman's Report from the House Committee on Science, Space, and Technology Task Force on the Health of Research, was released September 1992. OTA staff acted as technical advisor to the Task Force based on research done for the report, *Federally Funded Research: Decisions for a Decade*.

OTA staff was consulted in June 1992 by the Senate Committee on Appropriations about the status and evaluation of NSF's EPSCoR (Experimental Program to Stimulate Competitive Research), which was examined in *Federally Funded Research*. The Committee was trying to understand the pros and cons for increasing EPSCoR's FY93 appropriation to $24.5 million.

2. OTA produced a memo in April 1992 for the House Committee on the Budget Task Force on Defense, Foreign Policy, and Space, concerning priority-setting and agency portfolio-building. The memo was an input to Committee hearings and other discussions on "big science" projects, especially the SSC, and the need for cross-cutting budget decisions.

3. OTA staff provided support for the April 1992 House Subcommittee on Science Investigations and Oversight hearing on Projecting Science and Engineering Requirements for the 1990s: How Certain Are the Numbers? The hearing exposed the misuse by NSF of a model that predicts shortages of scientists and engineers.

4. OTA staff served as an expert witness at a Forum on Telecommunications and Dissemination, convened by the Subcommittee on Select Education of the House Committee on Education and Labor, April 2, 1992. The purpose of the Forum was to give Committee staff outside advice on a telecommunications initiative being proposed by the Department of Education. (The outcome of the meeting was development of additional language in the bill for the reauthorization of Office of Educational Research and Improvement.)

5. OTA's report, *Linking for Learning: A New Course for Education*, staff briefings for Senator Kennedy, and testimony were used to draft legislation and S. 3134, the Ready to Learn Television Act. (Affects delivery of information for young children.)

6. OTA's report, *New Ways: Tiltrotor Aircraft and Magnetically Levitated Vehicles*, was used by House Committee on Energy and Commerce, Rept. 102-297, as background on Federal policy issues for maglev and high-speed rail.

7. OTA was quoted in the Report of the House Committee on Appropriations zeroing out funds for magnetically levitated vehicles.

8. Language from *Delivering the Goods* influenced the wording of the Water Resources Development Act, particularly with respect to the possibility of utilizing the Corps of Engineers to assist with developing small rural systems. Subsequent intervention by trade groups deleted relevant language.

12.5. Changes in Prior Plans for FY 1992 for the Science, Information, and Natural Resources Division

During Fiscal Year 1992, the Science, Information, and Natural Resources Division essentially accomplished its goals, with approved modifications and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

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Telecommunication and Computing Technologies

NETWORKED INFORMATION AND INDIVIDUAL PRIVACY AND SECURITY

The Nation is rapidly moving toward a ubiquitous, interconnected telecommunication system in which digital data will predominate. The new network is based on computer technology and high-speed transmission technologies. This lays them vulnerable to abuses of personal and corporate privacy. Lessons have been learned from experience with private local communication networks involving security violations, malicious tampering, and misuse of privileged information. These occurrences are but a harbinger of the potential harm that could befall the public information networks as greater reliance is placed on them for business and confidential communication. Remedies and means of prevention are both technical and legal. Congress will likely soon be called upon to confront the dual problems of security and privacy as the national network changes in response to developing technology.

WIRELESS COMMUNICATION SERVICES

Over the last five years the demand for wireless personal communication services has exploded. Wireless technologies, which use radio waves rather than copper or fiber optic cable to transmit signals, now allow consumers to use cordless telephones at home, cellular telephones in their cars, and even telephones on commercial airlines. And more wireless applications are on the horizon; satellite systems, for example, are being designed that will allow people to send and receive telephone calls or text/data to and from any point on Earth. However, the radio frequency spectrum that make such services possible is already very crowded, and finding room for new radio technologies and applications will be difficult. The Federal Government, which manages the use of radio waves in the public interest, will increasingly be called on to mediate the fierce

U.S. House of Representatives
Committee on Science
Hearing On
Scientific and Technical Advice to Congress

Witness:
Congressman Rush Holt

Questions For the Record

Appendix J

Office of Technology Assessment
Justification of Estimates
Submitted to the
Subcommittee on Legislative Branch Appropriations
1995

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OFFICE OF TECHNOLOGY ASSESSMENT
UNITED STATES CONGRESS

Fiscal Year 1995 Justification of Estimates

Submitted to Subcommittees on
Legislative Branch Appropriations

DECEMBER 1993

management through elimination of one of OTA's three Division management groups and the operations manager as well as two general assignment senior associates generated significant personnel savings. The outline of the new organization is displayed in Schedules A and A-a and in the sections below. A planning and strategic process was also begun to fulfill further needs. Reorganized Divisions should consist of Programs which form sensible, coherent intellectual and scientific units, ones which foster increased intercommunication and efficient cooperative use of personnel resources. Continued savings should be possible through coalescing Programs and the elimination of a few Program management teams. This process is underway and should result in a leaner and more efficient organization with as little loss of productivity to downsizing as possible.

Relation of Work to Legislative Activity

OTA's role is neither to promote nor to discourage the development or the application of any particular technology or legislation, but rather to help Congress determine whether or when some form of Federal government participation may make sense. OTA identifies and clarifies options; exposes misleading, unsupportable, or incorrect information; and works to raise the level of understanding in the debate about expensive and controversial technical issues.

In each section on accomplishments in OTA's divisions, we identify some activities during fiscal year 1993 that illustrate the link between OTA's work and specific congressional activity. Please see the following pages for this information.

- *Industry, Commerce, and International Security Division* *35*
  - Energy and Materials **36**
  - Industry, Technology, and Employment **38**
  - International Security and Commerce **41**
  - Science, Education, and Transportation **42**
  - Telecommunication and Computing Technologies **42**
- *Health, Life Sciences, and the Environment Division* *63*
  - Biological and Behavioral Sciences **64**
  - Food and Renewable Resources **65**
  - Health **66**
  - Oceans and Environment **66**

Mandate Avoidance

OTA works closely with members of TAB and the Appropriations Committees to maintain the authority of TAB to set the agenda of the agency and the best use of OTA's limited resources for the whole Congress. Mandates are strongly discouraged as a mechanism to obtain OTA's help, and potential mandates are often avoided when we are able to work with the interested parties prior to passage of legislation into law.

Because of the support of OTA's Board and the Appropriations Committees, no mandates occurred in the 103d Congress. OTA also successfully convinced a committee to repeal an earlier mandate. Two small mandated studies were passed at the end of the 102d Congress, *P.L. 102-571* mandating a study of the regulatory and health assessment of dietary supplements and *P.L. 102-585* mandating a study of registries of health data on Persian Gulf veterans. Both studies will be completed by January 1994.

Continuing Mandated Functions

OTA continues to monitor veterans studies: *P.L. 96-151* requires OTA to monitor and evaluate certain studies by the Department of Veterans Affairs; *P.L. 98-160* requires OTA to monitor certain Federal research activities with regard to veterans exposed to atomic radiation; *P.L. 99-272* requires OTA to monitor certain Federal research activities related to women veterans.

OTA continues to appoint the members of the Prospective Payment Assessment Commission (ProPAC) and the Physician Payment Review Commission (PPRC). ProPAC is an independent advisory committee mandated under the Social Security Amendments of 1983 *(P.L. 98-21, Section 601, 42 U.S.C. 1395ww)* that reform the Medicare program payment method. The law requires the OTA Director to select the Commission members. The first Commissioners were appointed in 1983.

PPRC is also an independent advisory committee and was mandated by the Consolidated Omnibus Budget Reconciliation Act of 1985 *(P.L. 99-272, 42 U.S.C. 1395w-1)*. PPRC's purpose is to advise Congress and the Executive Branch on possible ways of reforming physician payment under the Medicare program. The law requires the OTA Director to select the Commission members. Initial appointments to the 13-member Commission were made in 1986, for terms ranging from one to three years.

P.L. 99-960 and *P.L. 102-507* also require the Director of OTA to appoint the members of the Advisory Panel on Alzheimer's Disease, which advises the Secretary of Health and Human Services on priorities and emerging issues related to Alzheimer's disease and related dementia. The first panel was appointed by the OTA director in 1987, and the panel was reauthorized in 1992. The panel's authorization terminates in 1995.

Interagency Coordination

In carrying out OTA's mission as a shared resource of the committees of the Congress, our staff cooperate and interact extensively with congressional members and staff and with the staffs of other Federal agencies, the private sector, and institutions around the world. This extensive networking serves to avoid duplication and to increase Congress's analytical resource base as it enables OTA to utilize the most up-to-date information available. In particular, OTA and the three other congressional support agencies have adopted processes that ensure fuller utilization of each other's expertise—in administrative as well as substantive areas. Senior staff from OTA, CRS, CBO, and GAO meet regularly to discuss topics on which each agency works, such as trade, education, health care, energy, agriculture, environment, transportation, and defense, in order to eliminate duplication and ensure that resources are devoted to each facet of an issue. A few recent examples of OTA networking that resulted in notable benefits to the Federal, State, and local government include:

- OTA continues to work closely with CRS, GAO, the Health Resources and Services Administration (HRSA), and the HHS Assistant Secretary for Planning and Evaluation (ASPE) on long-term care and case management issues. In July 1993, GAO held a congressional forum on long-term care; OTA staff assisted in planning the forum and moderated the forum for GAO. OTA and CRS have shared data and findings on State case management regulations and procedures for case management; this sharing of data benefits both agencies and is particularly helpful to OTA for the agency's staff paper on cost caps in case-managed long-term care.

- OTA participated in a CRS-sponsored congressional briefing on drug pricing in April, 1993. In addition, in August 1993, GAO staff asked OTA to review a draft of a GAO study of the impact of price controls on R&D, a subject that was briefly discussed in OTA's report. OTA's staff met with GAO staff and as a result of that review, the GAO report is currently undergoing extensive revision.
- OTA conducted extensive coordination with GAO, CRS, CBO, Physician Payment Review Commission, and Prospective Payment Review Commission, regarding Assessing the *Assumptions Behind Health Reform Projections*. GAO, CRS, CBO, PPRC all have work under way in this area, and OTA is consulting with them to ensure that there is not unnecessary overlap. Further, CBO has ongoing responsibilities in this area, and OTA is continuing to solicit information from CBO on the ways in which they model health reform proposals.
- OTA and GAO have coordinated their studies on Health Professions Training, with GAO concentrating on evaluation of the effectiveness of past efforts to improve specialty mix and lessen the impact on underserved areas, and OTA concentrating on potential techniques and programs to improve the situation in the future.
- In November 1992, soon after the start of OTA's assessment, *The Continuing Challenge of Tuberculosis*, OTA staff met with GAO staff who were also beginning work on TB in response to congressional requests. The purpose of the meeting was coordination — avoiding duplication of effort and sharing of resources. The meeting indicated that the work of the two agencies complement each other well. While OTA has focused on synthesizing current scientific understanding of TB and its control and giving a broad overview of Federal involvement, GAO was asked to evaluate in some detail Federally-funded TB control programs administered by State and local governments in several hard-hit communities. Staff from the two agencies have talked with each periodically about their respective projects.The GAO research is on-going at this date.
- On the basis of a list of questions from OTA about case management for long-term care and discussions with OTA staff, the Health Resources and Services Administration (HRSA) contracted for an analysis of policy-relevant findings from its congressionally-mandated "Health Care Services in the Home Demonstration Program." The results of the contract analysis are to be presented in November 1993. Also based on a list of questions from OTA about case management for long-term care, HRSA conducted a workshop on case management for special populations, the results of which were published in February 1993.
- HHS's Assistant Secretary for Planning and Evaluation (ASPE) is currently working on criteria for determining eligibility for long-term care for persons with cognitive impairment. OTA has provided information developed in 1989 to assist the Subcommittee on Health of the House Committee on Ways and Means in its work on the "Frail Elderly Bill," legislation intended to provide home and community-based services for people with dementia. OTA continues to participate on the advisory panel for ASPE's case management study.
- The HHS Office of Inspector General requested, and used, previously unpublished data from OTA's study of home infusion therapy, in an HHS IG report published September. 1993. OTA staff provided information, consulted with IG staff, and reviewed the IG report.
- Health Care Financing Administration (HCFA) staff used the OTA *Home Drug Infusion Therapy* report to help them make decisions about uniform Medicare coverage policy decisions under the new regional carrier system being put in place by HCFA, according to the medical director of one of the new regional carriers (spring 1993).

- Many of the options included in OTA's report on *Adolescent Health* were incorporated into the President's Health Security Plan (the health care reform plan).
- OTA coordinated the *Science & Technology, Renewable Resources, and International Development* study with GAO's new project on the role of private volunteer organizations (PVO's) in development that addresses: 1) when are PVOs appropriate in development, 2) how do their overhead rates affect funding use, and 3) AID effectiveness in determining when to use grants, contracts, cooperative agreements and how well do they administer/manage them.
- OTA coordinated the *Science & Technology, Renewable Resources, and International Development* study with GAO's new project on World Bank's portfolio management, including review of World Bank actions to improve accountability, loan policy, level of U.S. financial risk because of World Bank loans.
- GAO is reviewing OTA's body of work (5 reports) on African agriculture and environment as they develop a new GAO project on the role of U.S. industry and organizations in foreign aid.
- OTA coordinated the *Science & Technology, Renewable Resources, and International Development* study with ongoing CRS work on reviews of the Foreign Assistance Act and sustainable development discussions.
- CRS staff participated in several OTA meetings during the course of the study, *Harmful Nonindigenous Species in the United States*, including the hearings at which the study was released.
- The OTA report, *Energy Efficiency in the Federal Government: Government by Good Example?*, has been used extensively by several Executive agencies. The General Services Administration (GSA), with whom OTA worked closely in the course of this assessment, adopted an agency wide practice promoting equipment retrofits outlined in the report. OTA work has also been credited with improving communication between Federal facility personnel and private sector suppliers of energy efficient goods and services. For example, one large energy management company distributed copies of OTA's report to all its field representatives to improve their understanding of Federal energy management needs and opportunities.
- The OTA report, *Building Energy Efficiency*, is being used by several Federal agencies: by the Energy Information Administration, Department of Energy in planning their data collection and analysis on building energy use; by the National Renewable Energy Laboratory (NREL) for project planning and analysis; as a basic reference by the General Services Administration (GSA); and by the GSA's New York Field Office as a guide in putting together a training course for building operators. The report is also being used by State energy offices in Colorado and Arizona.
- Since the delivery of OTA's report, *Fueling Development: Energy Technologies for Developing Countries*, the World Bank has reported changing the structure of some of it energy projects in developing countries to reflect the "energy services" approach outlined in the OTA assessment. OTA staff have been invited to brief the senior World Bank staff on the project. In addition, the World Energy Conference has adopted the interim report, *Energy in Developing Countries*, as the basic document for discussion in their subcommittee on developing countries and it continues to have considerable impact on the thinking of the subcommittee.
- OTA's 1989 background paper, *Biological Effects of Electromagnetic Fields*, continues to be widely cited as the issues addressed in that report remain in public focus. OTA staff periodically

confer with counterparts in other research agencies including EPA, DoE, and Electric Power Research Institute (EPRI) on issues related to electromagnetic fields (EMF) and electric power systems and equipment. A number of outside experts have credited the OTA report and the publicity surrounding it as an important factor in encouraging both EPA and DoE to develop broader EMF research agendas.

- The World Bank continues to rely heavily on OTA's reports *Fueling Development* and *Energy in Developing Countries* in formulating its projects on energy efficiency and environmental issues. The Environment Department also recommends the reports as guides for environmental agencies in developing countries.
- OTA staff participate periodically in meetings with CBO, CRS, GAO on defense conversion issues.
- Many Federal agencies were engaged in the course of the study, *Dismantling the Bomb and Managing the Nuclear Materials*. The Department of Energy was prominent, with meetings and briefings on specific programs and issues held both at headquarters, as well as in trips to field facilities. A cooperative symposium was held with DoE that brought Russian scientists to OTA to discuss issues of mutual concern relative to treatment and management of high-level waste. Military agencies were also consulted, including the Defense Nuclear Agency, the Office of the Assistant to the Secretary of Defense for Atomic Energy, the Defense Intelligence Agency, the U.S. Army Corps of Engineers, and the nuclear decision-making components of each service. Other Federal agencies consulted included the Nuclear Regulatory Commission, the Department of State, and the Environmental Protection Agency.
- OTA received extensive cooperation from the Executive Branch in conducting the Literacy Study, especially from the Office of Vocational and Adult Education of the Department of Education. After the study was released, staff briefed the Assistant Secretary and senior staff in the Adult Education Division of the Department of Education.
- Throughout the study, *Access to Over-the-Road Buses for Persons with Disabilities*, OTA coordinated its efforts with the Office of the Secretary of the Department of Transportation (DoT) and the federal Architectural and Transportation Barriers Compliance Board. As directed under the Americans With Disabilities Act (ADA), the OTA report has been used as the basis of DoT's regulatory analysis for the implementation of regulations informing over-the-road bus operators of their compliance obligations under the ADA.
- OTA coordinated with GAO staff on data analysis in support of the GAO study, *The Availability of Intercity Bus Service Continues to Decline*, and the OTA study, *Access to Over-the-Road Buses for Persons with Disabilities*.
- OTA staff assisted FAA in organizing the Civil Tiltrotor Development Advisory Committee. This Committee was mandated by Public Law 102-581.
- OTA staff participated in or worked with four separate Federal Advisory Committees to the Federal Aviation Administration: FAA Research, Engineering, and Development Advisory Committee; Aviation Rulemaking Advisory Committee; Aviation Capacity Advisory Committee; and the FAA-sponsored Task Force for Global Navigation Satellite System Implementation.
- OTA participated in a joint NASA/American Institute of Aeronautics and Astronautics (AIAA) workshop on interactive effects of environmental technologies programs on other aviation system technologies.

- The OTA background paper, *Accessibility and Integrity of Networked Information Collections*, was released in conjunction with a July 14, 1993, meeting at the Library of Congress on "Delivering Electronic Information in a Knowledge-Base Democracy." This meeting was chaired by Vice President Gore and the Librarian of Congress, James Billington.
- The Social Security Administration automation study is being closely coordinated with relevant GAO staff.
- The OTA report, *Making Government Work,* included GAO, CRS, and executive agency staff in the research and review process, and reached out to similar efforts by state/local governments.
- Three of OTA's intellectual property reports, *Finding A Balance* (1992), *Copyright and Home Copying* (1989), and *Intellectual Property Rights* (1986) were used in Office of Science and Technology Policy's early 1993 report to Congress concerning the National Research and Education Network (NREN).
- The OTA reports *Defending Secrets* (1987) and *Electronic Record Systems and Individual Privacy* (1986) are cited in the information technology portions of the National Performance Review (NCR.IT.10—"Develop Systems and Mechanisms to Ensure Privacy and Security").
- OTA arranged and chaired three briefings on critical technologies for the Director and Deputy Director of the Office of Technology Policy, Department of Commerce.
- OTA staff have had ongoing input to GAO's inquiries into satellites and telecommunication matters.
- OTA and GAO staff organized a joint workshop on "Federal Agency Substance Abuse Prevention Initiatives," which was held at OTA on January 14 and 15, 1993. Information obtained from the workshop was incorporated into the OTA assessment report *Technologies for Understanding the Root Causes of Substance Abuse and Addiction* and into a number of ongoing GAO projects.
- On January 21 and 22, 1993, a workshop on "The Implications of Genetics Research and Mental Illness" was hosted by OTA. The workshop was a joint effort between OTA and the National Institute of Mental Health.
- Information from *Cystic Fibrosis and DNA Tests: Implications of Carrier Screening* (1992) and its accompanying background papers, *Genetic Counseling and Cystic Fibrosis Carrier Screening: Results of a Survey* and *Genetic Tests and Health Insurance: Results of a Survey* was used in recommendations of the National Institutes of Health (NIH)/Department of Energy (DoE) Health Insurance Task Force of the NIH/DoE Joint Ethical, Legal, and Social Implications (ELSI) Working Group for the Human Genome Project.
- The FBI and U.S. Attorney's Offices continue to cite *Genetic Witness: Forensic Uses of DNA Tests* (1990) in casework, and it is also used in local and State cases.

6. Changes in OTA's Prior Plans for FY 1993

During FY 1993, OTA essentially accomplished its goals, with approved modifications, negotiated reductions in some projects, and additions to others to meet the changing needs of Congress and to accommodate the inherent uncertainty of research. Also, during the year OTA's General and Administration activities were restructured in a way that allowed a greater share of resources to flow to the analytical divisions.

10.4 Accomplishments of the Industry, Commerce, and International Security Division

In FY 1993, the Industry, Commerce, and International Security Division published 17 assessment reports:

- Industrial Energy Efficiency
- Access to Over-the Road Buses for Persons with Disabilities
- Defense Conversion: Redirecting R&D
- The 1992 World Administrative Radio Conference: Technology and Policy Implications
- Energy Efficiency Technologies for Central and Eastern Europe
- Who Goes There: Friend or Foe?
- Adult Literacy and New Technologies: Tools for a Lifetime
- The Future of Remote Sensing from Space: Civilian Satellite Systems and Applications
- Aging Nuclear Power Plants: Managing Plant Life and Decommissioning
- Proliferation of Weapons of Mass Destruction: Assessing the Risks
- Multinationals and the National Interest: Playing by Different Rules
- U.S. Telecommunications Services in European Markets
- Making Government Work: Electronic Delivery of Federal Services
- Protecting Privacy in Computerized Medical Information
- Energy Efficiency: Challenges and Opportunities for Electric Utilities
- Contributions of DoE Weapons Labs and NIST to Semiconductor Technology
- Pulling Together for Productivity: A Union-Management Initiative at US West, Inc.

The Division also published 10 background papers:

- U.S. Banks and International Telecommunications
- Data Format Standards for Civilian Remote Sensing Satellites
- Advanced Network Technology
- Development Assistance, Export Promotion, and Environmental Technology
- Accessibility and Integrity of Networked Information Collections
- Chemical Weapons Convention: Effects on the U.S. Chemical Industry
- Aircraft Evacuation Testing: Research and Technology Issues
- Potential Environmental Impacts of Bioenergy Crop Production
- Information Systems Related to Technology Transfer: A Report on Federal Technology Transfer in the United States
- Biopolymers: Making Materials Nature's Way

In addition, the Division testified 15 times.

Listed below are several examples of direct legislative use of the Division's work:

Energy and Materials

1. The project staff of the assessment *Green Products by Design: Choices for a Cleaner Environment* consulted extensively with staff of the House Science, Space, and Technology Committee in the preparation of legislation introduced in the 103d Congress to promote environmental technology research and development and exports. OTA staff also were consulted by the House Committee

on Energy and Commerce Subcommittee on Transportation and Hazardous Materials concerning toxic use reduction and reauthorization of the Resource Conservation and Recovery Act.

2. The OTA report, *Energy Efficiency Technologies for Central and Eastern Europe*, was released in July 1993, just before the Senate consideration of the bill on financial and technical assistance to the former Soviet Union. Senate staffers reported that it was useful background material for the portions of the bill dealing with energy matters.

3. The report, *Industrial Energy Efficiency*, was released in April 1993 at a hearing before the Subcommittee on Renewable Energy, Energy Efficiency, and Competitiveness of the Senate Committee on Energy and Natural Resources. The hearing focused on the potential for enhancing U.S. industrial competitiveness through energy efficiency and waste minimization technologies.

4. Based on the findings of the report *Energy Efficiency in the Federal Government: Government by Good Example?*, OTA interacted extensively with the Senate Committee on Governmental Affairs and staff of the House Energy and Commerce Subcommittee on Energy and Power in development of the Federal energy efficiency provisions of Public Law 102-486, the Energy Policy Act of 1992 (specifically, Title 1-Energy Efficiency, Subtitle F-Federal Agency Energy Management).

5. Many of the findings and options of OTA's report, *U.S. Oil Import Vulnerability: The Technical Replacement Capability*, were adopted in the Energy Policy Act of 1992. The Act contains extensive provisions for alternative vehicle fuels, alternative feedstocks, and improved energy efficiency. One option formed the basis of S. 1018 introduced by Sen. Bingaman and referred to Senate Energy and Natural Resources Committee to establish national energy policy goals. S. 1018 was incorporated into the Energy Policy Act of 1992 (EPACT). During legislative consideration of EPACT in the 102d Congress, the report was cited by House and Senate committees and in floor statements.

6. OTA's report, *Building Energy Efficiency* and the earlier report, *Energy Efficiency in the Federal Government: Government by Good Example?*, were used by the staff of the Subcommittee on the Environment, House Committee on Science, Space, and Technology, to assist them in preparation of comprehensive energy R&D legislation that became the R&D titles in the Energy Policy Act of 1992. Committee staff have reported that the building energy efficiency report was used during negotiations by House and Senate conferees.

7. OTA's report, *Electric Power Wheeling and Dealing: Technological Considerations for Increasing Competition*, was also cited extensively in the early legislative discussions and hearings in the House Energy and Commerce Subcommittee on Energy and Power affecting the regulation of electric utilities.

8. OTA staff were consulted by several House and Senate staff regarding legislative proposals aimed at removal of older cars from the U.S. fleet as a result of the report *Retiring Old Cars: Programs to Save Gasoline and Reduce Emissions.*

9. During the course of the OTA assessment *Renewable Energy Technology Research Development, and Commercial Prospects*, OTA project staff were consulted by congressional committee staff in connection with hearings, and draft legislation on renewable energy issues. For example, OTA provided background information on hydrogen energy systems to minority staff of the House Committee on Science, Space and Technology, Subcommittee on Energy, for use in drafting H.R. 1479, the Hydrogen Future Act of 1993.

10. During preparation of the OTA background paper, *The Environmental Impacts of Bioenergy Crop Production*, OTA project staff assisted the staff of the House Committee on Energy and Commerce, Subcommittee on Energy and Power with suggestions for potential witnesses, issues, questions and background materials for hearings on the potential role of biomass energy systems to sequester carbon or offset fossil energy carbon emissions to reduce the greenhouse effect.

11. Building on the findings of OTA work on the biological effects of electromagnetic fields completed in the course of the assessment, *Electric Power Wheeling and Dealing: Technological Considerations for Increasing Competition*, and the background paper, *Biological Effects of Electromagnetic Fields*, throughout the 102d Congress OTA staff were consulted by staff of the House Committee on Science, Space, and Technology as they drafted legislation on federal research efforts on biological effects of electric and magnetic fields (EMF) and on the appropriate level, scope, and structure of federal research efforts.

Industry, Technology, and Employment

1. Legislation from both the House and the Senate—HR. 1432 and S. 473—reflect policy options from *Defense Conversion: Redirecting R&D* dealing with modifying the initiation and management of CRADAs (cooperative research and development agreements). Further options from this assessment, addressing CRADA management and reorganization of the DoE weapons labs, were incorporated into the defense authorization bills. Specific language in the bills can be traced to the report and to staff briefings of the House Armed Services Committee, the House Science, Space and Technology Committee, and the Senate Energy Committee.

2. *After the Cold War: Living with Lower Defense Spending* was relied upon heavily in the Defense Authorization and Defense Appropriations Acts for Fiscal Years 1993 and 1994. The FY 1993 Acts included extensive provision and funding for defense conversion programs, implicitly adopting definitions and structures proposed in the report.

Congress passed the Defense Authorization and Defense Appropriations Acts for Fiscal Year 1993, which included extensive provision and funding for defense conversion programs. The bills implicitly adopted the broad definition of defense conversion presented in *After the Cold War*, which emphasized investing in technological advance and economic growth at the community, regional and national levels, rather than focusing efforts on plant-level conversion. The bills also adopted the framework for conversion programs proposed in *After the Cold War*, which included programs for transition assistance for workers and communities for the short term, and longer term programs for technology diffusion and government-industry partnerships for development of commercial technologies.

3. In preparing the FY 1994 legislative package for defense conversion, the Senate Democratic Defense Conversion Task Force asked OTA to coordinate a series of three briefings, bringing in outside speakers and conducting workshops to identify major issues. The workshops addressed base property disposal, environmental assessment and cleanup at bases, and federal community development assistance. The workshops, and a detailed memo based on them and on *After the Cold War* prepared by OTA, led Senators Pryor and Bingaman to praise OTA and its staff (by name) when they introduced the Report of the Task Force on Defense Reinvestment as "instrumental in helping the task force develop these recommendations" and providing "invaluable assistance in preparing these recommendations."

4. Based on OTA's work with the Senate Democratic Defense Conversion Task Force (see #3), Senator Pryor submitted an amendment (cosponsored by a number of other Senators) to the FY 1994 DoD Authorization bill dealing with federal policies for easing adjustment to base closures and defense industry closures. Virtually all the components of the amendment stemmed from *After the Cold War* and OTA's work with the Task Force. The provisions included: expedited interim leasing of bases, expedited environmental cleanup, moratoria on removal of certain types of base property, greater participation of affected communities in DoD policy making, and policy allowing DoD to sell bases at less than full market value.

5. Based on *After the Cold War*, OTA provided Congressman Wise, Chairman of the Subcommittee on Economic Development of the Public Works Committee, with information and guidance for a directory of economic development programs for defense conversion that the Committee intends to publish as a Committee document. OTA also wrote a short memo discussing problems communities are likely to face when dealing with defense cutbacks, particularly base closures, as background for, or as inclusion into, the Committee's report.

6. T*rade and Environment: Conflicts and Opportunities* was deemed the major centrist piece on the topic by a representative of the International Trade Commission. Groups as diverse as the Center for International Environmental Law, the Council on Foreign Relations, the National Science Foundation, the National Security Council, and the State Department Transition Team have used this background paper as core material for their meetings and work. EPA managers have also relied on the information in the report, as have officials in the states. The Office of the U.S. Trade Representative routinely recommends this report to callers who want to understand trade and environment issues.

7. *Trade and Environment* and the second background paper on international industrial competitiveness and the environment, *Development Assistance, Export Promotion, and Environmental Technology*, combined with briefings on ongoing work, provided information and ideas for congressional committees working on S. 1074, a bill to promote U.S. environmental exports, and S. 978, the National Environmental Technology Act of 1993. For example, OTA work helped the committees working on S. 1074 in defining the role of proposed regional environmental export centers.

8. Vice President Al Gore, in *From Red Tape to Results: Creating a Government that Works Better & Costs Less* (Report of the National Performance Review, September 7, 1993) quoted from *After the Cold War* in his comments on Job Training Partnership Act:

> "When Congress enacted JTPA, it sought to avoid such problems. It let local areas tailor their training programs to local needs. But Federal rules and regulations have gradually undermined the good intentions. Title III, known as the Economic Dislocation and Worker Adjustment Assistance Act (EDWAA), helps states respond immediately to plant closings and large layoffs. Yet even EDWAA's most flexible money, the 'national reserve fund,' has become so tangled in red tape that many states won't use it. As Congress's Office of Technology Assessment put it, 'the process is simply too obstacle ridden. ... many state EDWAA managers cannot handle the complexities of the grant application, and those that do know how are too busy responding to clients' urgent needs to write demanding, detailed grant proposals.'"

9. *U.S.-Mexico Trade: Pulling Together or Pulling Apart?* has become a primary source of comparisons on production costs in the two countries, notably for the automobile industry. The report's cost estimates have been extensively cited by Members of Congress, by the Administration, and in the press. The report is considered a primary resource by the Economic Policy Council (EPC) of the United Nations Association of the USA, co-chaired by Paul Allair, Chairman and CEO of Xerox, and Jack Sheinkman, President of the Amalgamated Clothing and Textile Workers. Many direct quotations and discussions based on the Mexico report have been included in Member statements, in position papers and testimony by advocacy groups (both pro-NAFTA and anti-NAFTA, and in the press. As a result, it seems fair to say that the analysis in *U.S.-Mexico Trade* helped shape the public debate on NAFTA, particularly through its focus on the need to prepare the U.S. work force for future competition. The report also influenced the U.S. negotiating position on the side agreements, which the three governments began to discuss shortly after the report was issued.

10. In drafting amendments to S.4 designed to improve State and Federal industrial extension services, the Senate Commerce Committee drew on findings from OTA's *Worker Training* and *U.S.-Mexico Trade* reports. Currently State and Federal industrial extension services focus primarily on hardware, and give little attention to how work is organized and workers are trained to use the new technology. The amendments to S.4 incorporate into the bill a major theme of *Worker Training* by specifying that industrial extension services explicitly address the organization of work.

11. In the 1993 Energy Policy Act (Sec. 2108) Congress directed DoE to prepare and submit to it a study that identifies technologies that significantly reduce waste and energy usage. Based on *Serious Waste Reduction* and on files and contacts for the ongoing assessment of American Industry and the Environment, OTA assisted DoE to scope the issues and technological opportunities.

12. Senator Moynihan, as Chairman of the Senate Finance Committee, wrote the Chairman of the International Trade Commission requesting the Commission to collect and analyze information on the competitiveness of U.S. industries producing environmental goods and services. In establishing the rationale for the request, Senator Moynihan wrote: "Recent reports prepared by the Office of Technology Assessment at the request of the Committee have highlighted the emerging market opportunities for U.S. exporters of [environmental technology] goods and services. The OTA reports have also underscored the need for better data about the extent to which U.S. competitors are involved in export promotion of their environmental goods and services." The reports referred to are *Trade and the Environment: Conflicts and Opportunities* and *Development Assistance, Export Promotion and Environmental Technology*.

13. OTA participated on a review panel of DoD's Office of Economic Adjustment state planning grant program to review over 20 state proposals for defense conversion funds. The state program was created by Congress in the FY 1993 DoD Authorization Bill, in part in response to policy option in *After the Cold War* discussing the need for states to do more in the area of conversion and to be more proactive in acting before layoffs occurred.

14. The OTA Background Papers *Development Assistance, Export Promotion, and Environmental Technology* and *Trade and Environment: Conflicts and Opportunities* played a role in shaping President Clinton's export policy, and was helpful to the Trade Promotion Coordinating Committee (TPCC) in preparing its report to Congress. TPCC is an interagency advisory group, and its members say the two OTA background papers were extremely useful to their work. President Clinton asked the Commerce Department to direct another interagency group to formulate an environmental export and environmental technology strategy; members of this body have used and praised the

OTA background paper; they also met with OTA to seek input. The background papers were also used by Eximbank, AID, the Commerce Department, and the U.S.-Asia Environmental Partnership. The Environmental Business Council of the United States and the Environmental Technology Export Council, two major environmental industry associations, have used the OTA reports in their work; the president of one of the organizations cited *Development Assistance* as required reading in the field.

International Security and Commerce

1. On June 16, 1993, OTA staff briefed staff of the Senate Committee on Governmental Affairs on the contents of *Proliferation of Weapons of Mass Destruction: Assessing the Risks*, the first report of the current nonproliferation study. Particular attention was paid aspects touching upon two bills submitted by Senator Glenn and Representative Lantos on nuclear nonproliferation topics and may contribute to actions during markup of the Omnibus Nuclear Proliferation Control Act of 1993, and the Nuclear Export Reorganization Act, both offered by Senator Glenn. The definition of "nuclear explosive device" in the prospective legislation was changed to avoid capturing things such as nuclear reactors that are clearly not bombs.

2. OTA staff testified before the House Committee on Science, Space, and Technology on remote sensing on May 6, 1993, connected with the release of the OTA report, *The Future of Remote Sensing from Space: Civilian Satellite Systems and Applications*. The testimony was used as input to the drafting of H.R. 2200, which cited the OTA report. This study agreed that NASA's Earth Observing Program should include more observations from small satellites and from unpiloted air vehicles.

3. OTA staff testified before the Senate Subcommittee on Defense Technology, Acquisition, and Industrial Base of the Committee on Armed Services in May 1993 on acquisition and the defense industrial base. This testimony affected the drafting of the Defense Authorization Act of 1994.

4. On April 22, 1993, OTA staff briefed House Science, Space, and Technology Committee members and staff about OTA's report on the space station. This information was used as input in committee deliberations on H.R. 2200.

5. Also in September, OTA released its report, *The Future of Remote Sensing from Space: Civilian Satellite Systems and Applications*, at a briefing in the hearing room of the House Space Subcommittee, attended by staffers from several committees. The report language of H.R. 2200 includes reference to OTA's option in its study, which support the acquisition of data from unpiloted aircraft and other inexpensive means of data acquisition.

6. Testimony related to OTA's report, *Cooperative Aerial Surveillance in International Agreements*, was cited by Senator Pell in his speech recommending ratification of the Open Skies Treaty, which was accomplished on August 6, 1993.

7. In October 1992, OTA staff submitted a statement for the record to the Subcommittee on Technology and Competitiveness of the House Committee on Science, Space, and Technology, which substantially affected the final language of the National Aeronautical Research and Competitiveness Act.

8. On January 15, 1993, OTA staff briefed eighty officials from the Executive Branch (including such agencies as the Departments of Commerce, Defense, Treasury, and Labor) on issues related to the defense technology and industrial base. The briefing was founded on the OTA study on the

topic, *Building Future Security: Strategies for Restructuring the Defense Technology and Industrial Base*, and affected Defense Department actions in implementing relevant provisions in the Defense Authorization Act of 1993.

9. OTA staff briefed defense technology and industrial base issues to the Army Science Board Study Group on March 3, 1993. This briefing affected Defense Department policies on acquisition issues.

10. On January 21, 1993, OTA staff discussed shipbuilding strategies by the U.S. Navy with Representative Taylor and staff of the House Armed Services Committee staff. This affected the language of the Defense Authorization Act of 1994 regarding the National Shipbuilding Initiative.

11. OTA staff briefed staff of the House Science, Space, and Technology Committee on its background paper on orbital debris. OTA's work was eventually used in the drafting language for the committee's authorizing legislation (H.R. 2200) to require a report from the Administration on its progress in developing an international plan to reduce production of new orbital debris.

12. On May 26, 1993, and August 3, 1993, OTA staff met with Senator Dodd's staff on the possibility of demilitarizing Soviet submarines, using money from the Nunn-Lugar Amendment, and performing the work in the United States. Probably as a result of these discussions, the idea was abandoned.

13. Also in September, OTA released *Proliferation of Weapons of Mass Destruction: Assessing the Risks* at a press conference held by Senators Pell and Glenn. The report will affect outcomes of the Omnibus Nuclear Proliferation Control Act of 1993, the Nuclear Export Reorganization Act of 1993, the forthcoming revision of the Export Administration Act, and the ratification vote for the Chemical Weapons Convention.

Science, Education, and Transportation

1. OTA staff briefed Senator Harkin's staff about R&D support for accessibility technologies on over-the-road buses, as a preliminary to congressional rethinking of issues surrounding over-the-road bus service to rural areas.

2. *Testing in American Schools* changed the debate in Congress over educational standards and shifted the focus from mandatory to voluntary standards and assessments.

3. OTA education staff provided direct support and briefings for members working on legislation to provide greater access by schools to computer and telecommunications technology.

4. In H.R. 89, the Technology Education and Assistance Act of 1993, the legislative language draws extensively on both *Power On!* and *Linking for Learning*.

Telecommunication and Computing Technologies

1. OTA's 1988 report *Informing the Nation* was used in the debate leading up to enactment of the Government Printing Office Electronic Information Access Act of 1993, Public Law 103-40.

2. OTA's 1988 report *Informing the Nation* and 1990 report *Helping America Compete* were used as background by the Administration in preparing the National Performance Review and National Information Infrastructure reports and the revised OMB Circular A-130, Management of Federal Information Resources.

3. OTA's 1991 report *Automated Record Checks of Firearm Purchasers* was used by the congressional leadership in formulating legislative proposals for consideration by the 103rd Congress.

4. OTA's 1991 report *The FBI's Automated Fingerprint Identification Program* was used by the FBI and the Department of Justice in implementation of the automation program.

5. OTA's ongoing study of the Social Security Administration automation program was used by the SSA in developing strategic planning, electronic delivery, and reengineering initiatives.

6. S.4, calls upon NIST to respond to OTA's report Global Standards.

10.5 Changes in Prior Plans for FY 1993 for the Industry, Commerce, and International Security Division

During Fiscal Year 1993, the Industry, Commerce, and International Security Division essentially accomplished its goals, with approved modifications and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

10.6 FY 1994 and FY 1995 Priorities for the Industry, Commerce, and International Security Division

A Division's work is determined by the expressed needs of congressional committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and congressional committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the assessments that the Industry, Commerce, and International Security Division may be asked to undertake in Fiscal Years 1994 and 1995. Because OTA works hard to be responsive to changing Congressional needs, new work is often significantly different from OTA's prospective list, but it usually does contain some of the identified issues.

Energy and Materials

Energy Research and Development: Meeting the Nation's Needs

The U.S. Department of Energy spends about $5 billion annually on its energy program research and development activities. Given the diverse nature of DoE's energy R&D portfolio and of the nation's energy needs, it is a difficult task for Congress to determine which projects represent a high priority use of Federal funds. Often, the relationship between DoE's R&D activity and commercial energy needs is unclear. For example, while a rapidly changing external environment has increasingly focused the nation's energy efforts on improving energy efficiency, efficiency accounts for under 5% of the energy R&D spending in DoE's program. Similarly, while coal provides over half of the nation's electricity supply, less than 3% of DoE's energy program R&D

11.4 Accomplishments of the Health and Life Sciences Division

In FY 1993, the Health, Life Sciences, and the Environment Division published 10 assessment reports:

- Pharmaceutical R&D: Costs, Risks, and Rewards
- Drug Labeling in Developing Countries
- An Inconsistent Picture: A Compilation of Analyses of Economic Impacts of Competing Approaches to Health Care Reform by Experts and Stakeholders
- Water for Walker Lake
- Alternative Coca Reduction Strategies in the Andean Region
- Dismantling the Bomb and Managing the Nuclear Materials
- Benefit Design in Health Care Reform: Clinical Preventive Services
- Harmful Non-Indigenous Species in the United States
- The Continuing Challenge of Tuberculosis
- OTA Assessment: The Department of Veterans Affairs Persian Gulf Veterans' Health Registry

The Division also published 13 background papers:

- Science and Technology Issues in Coastal Ecotourism
- Federal and Private Roles in the Development and Provision of Alglucerase Therapy for Gaucher Disease
- Genetic Counseling and Cystic Fibrosis Carrier Screening: Results of a Survey
- Genetic Tests and Health Insurance: Results of a Survey
- Coverage of Preventive Services: Provision of Selected Current Health Care Reform Proposals
- Hazards Ahead: Managing Cleanup Worker Health and Safety at the Nuclear Weapons Complex
- Health Insurance: The Hawaii Experience
- Compilation of Abbreviations and Terms
- Hip Fracture Outcomes in People Age 50 and Over: Mortality, Service Use, Expenditures, and Long-Term Functional Impairment
- Biomedical Ethics in U.S. Public Policy
- Biological Components of Substance Abuse and Addiction
- Impact of Legal Reforms on Medical Malpractice Costs
- Benefit Design in Health Care Reform: Patient Cost-Sharing

In addition, the Division testified 9 times.

Listed below are several examples of direct legislative use of the Division's work:

Biological and Behavioral Sciences

1. As in the 101st and 102d Congresses, information from *Genetic Witness: Forensic Uses of DNA Tests* influenced the scope and approach in several pieces of legislation designed to set quality assurance standards for forensic DNA facilities and to provide guidelines for forensic DNA databanks. That legislation included: H.R. 829, "DNA Identification Act of 1993 (passed House 374-4 on March 29, 1993); H.R. 2459, "Federal Bureau of Investigation (FBI) Appropriations Authorization Act, Fiscal Year 1993"; S. 497, "DNA Identification Act of 1993"; and various omnibus crime bills, including S. 1488 and H.R. 3131.

2. The recently released *Biomedical Ethics in U.S. Public Policy* was a product of an agreement between Senators Hatfield and Kennedy that resulted in the withdrawal of the Hatfield Amendment to S. 1 "National Institutes Revitalization Act of 1993" that would have imposed a moratorium on certain issues related to patenting DNA. Upon completion of the report, Senator Hatfield introduced S. 1042, "a bill to amend the Public Health Service Act to establish an Ethical Advisory Board, and for other purposes."

3. *Cystic Fibrosis and DNA Tests: Implications of Carrier Screening* and its background papers, *Genetic Counseling and Cystic Fibrosis Carrier Screening: Results of a Survey* and *Genetic Tests and Health Insurance: Results of a Survey*, could affect report language of H.R. 2518, which includes appropriations for DHHS and NIH, specifically as that language might relate to oversight by a commission or other body of the NIH Ethical, Legal, and Social Issues (ELSI) Program of the Human Genome Project. This report and *Genetic Monitoring and Screening in the Workplace* (OTA 1990) also provided background/basis, in part, of the justification for a similar request via report language attached to the NIH reauthorization bill (Public Law 103-43).

Food and Renewable Resources

1. *A New Technological Era for American Agriculture*: The Report was used as background for a series of hearings by the Senate Agriculture, Nutrition and Forestry Committee on the overuse of pesticides on fruits and vegetables to enhance their cosmetic appearance. The report findings on agricultural research priorities were used to organize a series of hearings by the House Agriculture Committee on current research priorities and the need for a strategy for new research facilities.

2. *Agricultural Commodities as Industrial Raw Commodities*: The report findings were used in hearings by the Senate Agriculture, Nutrition and Forestry Committee in oversight hearings of the Alternative Agriculture Research and Commercialization Center. The Center concept was a policy option discussed in the report. The report was used as a guide to determine whether the Center was addressing the most critical areas of research for nonfood uses of agricultural products.

3. *Enhancing the Quality of U.S. Grain for International Trade*: The report findings were used in the reauthorization legislation for the Federal Grain Inspection Service of USDA. In particular, report findings led to language in legislation prohibiting the adding of water to grain for the intended purpose of minimizing dust explosions in grain elevators.

4. *Harmful Non-Indigenous Species in the United States*: The report was publicly released in October at a joint hearing of the House Merchant Marine Fisheries Committee's Subcommittee on Environment and Natural Resources and its Subcommittee on Fisheries Management. The report was used in hearings in October on ballast water introductions by the Fisheries Management Subcommittee, House Merchant Marine and Fisheries Committee, especially as it relates to Senator Mitchell's bill (S. 1198) on Eurasian watermilfoil. OTA provided technical assistance regarding importation of raw timber to the Committee on Small Business, Subcommittee on Regulation, Business Opportunities, and Energy as it evaluated USDA's proposed regulations.

5. *Alternative Coca Reduction Strategies in the Andean Region*: The report was presented to the new President of Bolivia by Senator Biden (Chairman of the Senate Judiciary Committee, requester) as an indication of U.S. interest in seeking a solution to the narcotics production and consumption problems. The Colombian Government has requested assistance from an OTA

contractor on *Alternative Coca Reduction Strategies in the Andean Region* in developing a new Colombian coca control approach. The OTA report and project staff assistance will be used by the contractor in addressing the Colombian Government's request.

The International Narcotics Control Act of 1988 (P.L. 100-690) specifically identifies the need for development of alternative crop options for Andean coca producers and earmarks funding for testing of environmentally safe herbicides for coca eradication. These provisions could be affected by OTA findings in *Alternative Coca Reduction Strategies in the Andean Region* that suggest broadening alternative options beyond agricultural opportunities is likely to be more effective. Also the OTA report finds that crop control of any sort (chemical or biological) is highly controversial and unlikely to be acceptable to the Andean countries and that such control without viable alternative economic options for producers is likely to only shift rather than halt coca production.

Health

1. Based on OTA's report, *Evaluation of Oregon's Medicaid Proposal*, OTA staff prepared a staff memo for interested congressional staffers to provide an overview of changes in Oregon's resubmitted waiver application in December 1992.

2. On September 7, 1993, the Senate Committee on Labor and Human Resources reported out of committee authorizing legislation that includes amendments to the Public Health Service Act extending grant programs for the prevention and control of tuberculosis (S. 1318; Report No. 103-135). While considering this legislation, committee staff were in touch with OTA staff about OTA's analysis in *The Continuing Challenge of Tuberculosis*. The grant programs included in this legislation would cover many of the TB control activities examined in OTA's report.

3. Specific legislation dealing with pricing of drugs developed by the government is scheduled for introduction by Senator Pryor. That legislation is a direct outgrowth of OTA's case study on alglucerase, a drug discovered and tested largely with NIH funds, but which carries a very high price tag.

4. *An Inconsistent Picture: A Compilation of Analyses of the Economic Impacts of Competing Approaches to Health Care Reform by Experts and Stakeholders* sparked considerable discussion among the members of Congress represented on TAB, and in other congressional arenas. For example, 100 copies of the report were ordered by the Senate Finance Committee for its use.

5. Appendix C of *Adolescent Health*, on data limitations, was quite influential in the language inserted by Rep. Schroeder into the NIH Reauthorization Bill. The language mandated that a longitudinal study of adolescents be undertaken by the National Institute on Child Health and Human Development (NICHD).

Oceans and Environment

1. *Dismantling the Bomb and Managing the Nuclear Materials* was released in September 1993 by Senator John Glenn, Chairman of the Senate Government Affairs Committee, at a press conference in the Committee's hearing room. Shortly after releasing the report, Senator Glenn sent a copy of the report to each member of the Senate with an accompanying "Dear Colleague" letter calling their attention to the policy options contained in the report. Shortly after the report was released,

OTA briefed Senator Carl Levin regarding advanced nuclear reactor design issues that were contained in the DoE appropriations bill. Many members used the OTA report as background for the appropriations debate.

2. *Preparing for an Uncertain Climate*: OTA has been working with the staff of the House Committee on Science, Space, and Technology on potential revisions to the United States Global Research Program, and the Committee will be holding hearings on that subject during the fall 1993.

3. OTA was able to assist Senator Harry Reid, who asked that OTA examine possible alternatives for dealing with seriously declining water levels in Walker Lake in Nevada. OTA made a site visit and prepared a report, *Water for Walker Lake*, outlining several options for Senator Reid. Some of these options were adopted and are now being implemented by Senator Reid and his staff.

11.5 Changes in Prior Plans for FY 1993 for the Health, Life Sciences, and the Environment Division

During Fiscal Year 1993, the Health, Life Sciences, and the Environment Division essentially accomplished its goals, with approved modification and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

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Biological and Behavioral Sciences

Organ Transplants

While surgical transplantation of human organs is now done at many medical centers, the shortage of donated organs has become a major hurdle. Questions of possible markets, ethics, rationing, and costs swirl around this subject. Furthermore, improvements in technology might reduce the number of organs required. Is there a real promise for technology improvements?

U.S. House of Representatives
Committee on Science
Hearing On
Scientific and Technical Advice to Congress

Witness:
Congressman Rush Holt

Questions For the Record

Appendix K

Office of Technology Assessment
Justification of Estimates
Submitted to the
Subcommittee on Legislative Branch Appropriations
1995

Relevant Pages
301-307
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OFFICE OF TECHNOLOGY ASSESSMENT

UNITED STATES CONGRESS

Fiscal Year 1996 Justification of Estimates

Submitted to Subcommittees on
Legislative Branch Appropriations

DECEMBER 1994

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4. Overview of OTA's Role

OTA continues, as it has since 1972, to follow the agenda set by the requests from committees of Congress and approved by its bipartisan Technology Assessment Board (TAB) "as an aid in the identification and consideration of existing and probable impacts of technological application (P.L. 92-484)." Each year sees a shifting array of issues in science and technology to which OTA must respond, and which require a consistent approach and the delivery of accurate, complete, nonpartisan information, analysis and conclusions that can serve as a foundation for congressional deliberations and actions. OTA's reports help the Congress: in the preparation of specific legislation, in deliberating from a general background and base of information and knowledge and in providing oversight and monitoring of executive programs.

Just as OTA's organization reflects the full spectrum of sectors of the economy and subjects and disciplines of science and technology, there is scarcely an issue that comes before the Congress that does not have a technological, scientific component, and which cannot benefit from the structured approach and the scientifically literate staff expertise that OTA routinely brings to bear.

In 1994 the legislative subcommittees of the House and Senate Appropriations Committees instructed OTA to focus its work more sharply on the scientific and technological aspects of work for its committee clients. In doing so OTA reviewed its enabling statute, P.L. 92-484, and drafted a proposed plan to ensure that work would be clearly scientific/technological in nature. At least three objectives were to be achieved by this response: to comply with the terms of the statute, to avoid duplication of efforts by other support agencies of the Congress, and to take full advantage of the unique (to the Congress) qualification in advanced education and experience in a wide variety of scientific disciplines available in OTA's professional staff.

OTA's proposed plan was approved by OTA's Board on June 23, 1994. An important feature of the plan was the commitment to prepare a technology content analysis, reflected in a technology page to be included at the front of every proposal brought before OTA's Board for approval. This page specifies the technological applications, their impacts and the relevant sections of the OTA statute involved in each proposal. Inclusion of this page assists Board review and approval by providing a specific enumeration of the strength and extent of the technological and scientific focus and content of each OTA project. All technology pages prepared since the initiation of this policy are included in this FY 1996 Justification of Estimates as a clarification of the technology context of each Board approved project (see section 15.E., p. 131). Staff of the Appropriations Committees also were invited to and did attend Board staff and formal Board meetings to familiarize themselves with OTA's Board review and approval process.

These general features of OTA's structure and function provide the framework from which congressional committees propose an extensive series of specific investigations in support of plans and likely priorities for the 104th Congress.

Two reports have been released on Multinational Corporations and the U.S. Technology Base exploring the role of multinational corporations in the development of technologies for American industry and the way that technology diffuses and is controlled through networks of multinationals and their subsidiaries. This analysis points out the major implications for U.S. trade and competitiveness of how and most importantly where advanced research is carried out and where the new technology is located. OTA continues to work on a related issue Commercialization of Emerging Technologies and issues relevant to the conceptualization of a technology policy.

Major work has been delivered and more is in process on proliferation of weapons of mass destruction, including technologies for detecting, assessing the risk, and controlling proliferation, as well as technologies for counterproliferation, including preventive, active and passive measures. Congress's concern about the future of the U.S. space launch industry and the uses to which satellites might be put have spawned a number of projects to provide Congress with information on ways to structure approaches to this industry and vital national security sector.

In the 104th Congress OTA's Energy Transportation, and Infrastructure Program expects to deliver work on *Cities, Technology, and Infrastructure* responding to the needs of the Senate and House Banking Committees and the House Public Works and Transportation Committee. New communications, information, and transportation

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production technologies have affected and will continue to affect the distribution and location of economic activity in America's cities and suburbs, and this in turn will need to be understood to direct the wise use of public and private transportation and other infrastructure investments. At the same time, *Advanced Automotive Technologies* will play a role not only in urban and transportation policy but in energy and environmental policies as well. It is expected that OTA's work in this and related energy, transportation, and infrastructure areas will be useful to a number of committees.

OTA's Education and Human Resources Program at the request of the Education and Labor Committee and the Labor and Human Resources Committee has begun to take a look at the technologies useful to work based learning and training and how these might make a difference in the employability of America's youth, their preparation to use the technologies becoming so pervasive in the workplace and the competitiveness of American industry. In a study with particularly wide application OTA is also embarked on a careful look at the full scope of *Residential Design Technologies for Elderly and Disabled Populations*. It has long been thought that facilities for these populations do not take full advantage of the technological potential for improvement in the care of patients.

OTA's new Environment Program is more diverse than in the past and its projects reflect this increased diversity. A great variety of impacts, environmental and health and the like, flow from the extensive nuclear contamination of the former Soviet Union, particularly in the Arctic and this contamination of the waters of the northern oceans has world wide implications (including specifically Alaska). An extensive assessment of the *Arctic and other Regional Impacts from Soviet Nuclear Contamination* is underway looking over a huge geographic area with very severe contamination. Smaller projects undertaken include a look at the potential for *Biological Pest Control* as the number of chemical pesticides available for agriculture diminishes.

Finally, in support of health reform efforts which may be undertaken in the 104th Congress, OTA has delivered Reports on *International Differences in Health Technology, Services and Economics, Identifying Health Technologies that Work*, and has illuminated the strengths and usefulness of economic projections in reports on *Understanding Estimates of Expenditures Under Health Reform*. OTA is also researching impacts of antibiotic resistant bacteria. The emergence of strains of common infectious bacteria that are resistant to almost all, or all, of the currently available antimicrobial drugs is becoming recognized as a significant threat to the public health. It is important for the Congress to know the extent of this threat, the seriousness of the implications for health care, and the possible actions that might be taken to ameliorate the situation.

OTA's work in FY 1996 will continue to reflect the explicit needs of the committees of jurisdiction. The bipartisan, bicameral Technology Assessment Board will guide OTA's work with committees and shape the agency's agenda through the assessment proposal approval process. OTA serves as a shared resource for Congress, providing nonpartisan analysis of scientific and technological issues—issues intrinsic to all important policy issues—in a highly cost-effective way.

5. OTA's Accomplishments During Fiscal Year 1994

During FY 1994, OTA delivered 51 publications to Congress, including 22 assessment reports, 27 background papers, and 2 administrative documents (see p.83). As of September 30, 1994, 44 TAB-approved studies and 9 special responses were in progress. As an integral part of carrying out assessments, OTA also provided expert advice, briefings, testimony, and results of OTA assessments matched to the specific needs of the requesting committees and the congressional agenda (see p. 127).

Throughout FY 1994 OTA designed and considered, reviewed at all staff levels and thoroughly discussed at a senior management retreat a sweeping reorganization of the agency, the initial steps of which were described in the FY 1995 Justification of Estimates. This reorganization was designed to achieve a number of objectives. OTA responded to the budgetary cutbacks in the Legislative Branch by creating substantial economies through the elimination of about 35-40% of senior management positions; these annualized savings amount to approximately $1.3 million/year. As the number of full time equivalent positions allowed has shrunk, it has been desirable to ensure that research units (programs) maintain a reasonable "critical mass" size which can be achieved by

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collapsing programs to a smaller number. In addition elimination of a number of internal boundaries and establishment of a culture of collaboration and sharing has allowed for much improved cross program and cross discipline cooperation and reinforcement. Within reason larger research units also allow more diversity and provide for the capacity for staff in the program to engage in multiple projects at the same time. The result of all this is a more efficient and of course much less expensive organization.

The organization currently has two divisions—down from three—and six programs—down from nine (see pages 22-23 for organization charts before and after reorganization). In addition support offices are no longer in a separate management line with separate senior managers; instead they now report to the research division directors, allowing for the support staff to feel directly useful to the research production side and for the research side to be in close contact and to understand the problems and contributions of the support side more intimately. OTA has shrunk by exactly one third in its research structure, although the actual production units, the project teams, have been preserved insofar as the FTE restrictions have allowed, i.e., to a large extent. During the present and for the future, OTA plans to let this sweeping change shake down. Senior management is essentially all new. Of the nine senior managers (Director, Assistant Directors, and Program Directors), seven hold new positions and of the two continuing program directors, both carry additional responsibilities. Average age of senior managers has dropped from 55 to 46.

OTA's management takes pride in the fact that with improved efficiency the agency's output has remained stable in the face of diminishing resources.

The improved focus of the agency on science and technology in response to the instructions of the Appropriations Committees has been detailed in the previous section.

Relation of Work to Legislative Activity

OTA's role is neither to promote nor to discourage the development or the application of any particular technology or legislation, but rather to help Congress determine whether or when some form of Federal government participation may or may not make sense. OTA identifies and clarifies options; exposes misleading, insupportable, or incorrect information; and works to raise the level of understanding in the debate about expensive and controversial technical issues.

In each section on accomplishments in OTA's divisions, we identify some activities during fiscal year 1994 that illustrate the link between OTA's work and specific congressional activity. Please see the following pages for this information.

- *Industry, Commerce, and International Security Division*
  - Energy, Transportation, and Infrastructure, 38
  - Industry, Telecommunications, and Commerce, 38
  - International Security and Space, 41
- *Health, Education, and Environment Division*
  - Education and Human Resources, 60
  - Environment, 61
  - Health, 62

Mandate Avoidance

OTA works closely with members of TAB and the Appropriations Committees to maintain the authority of TAB to set the agenda of the agency and the best use of OTA's limited resources for the whole Congress. Mandates are strongly discouraged as a mechanism to obtain OTA's help, and potential mandates are often avoided when we are able to work with the interested parties prior to passage of legislation into law. Because of the support of OTA's Board and the Appropriations Committees, no mandates were enacted in the 103rd Congress. Two small mandated studies are currently underway, P.L. 102-571 mandating a study of the regulatory and health assessment of dietary supplements and P.L. 102-585 mandating a study of registries of health data on Persian Gulf veterans. Both

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studies will be completed in FY 1995. P.L. 101-549 mandates OTA to participate in an EPA study which will determine whether or not further reductions in emissions from light-duty vehicles should be required. The study is not due until June 1997, and therefore work is not expected to commence until FY 1996.

Continuing Mandated Functions

OTA continues to monitor veterans studies: P.L. 96-151 requires OTA to monitor and evaluate certain studies by the Department of Veterans Affairs; P.L. 98-160 requires OTA to monitor certain Federal research activities with regard to veterans exposed to atomic radiation; P.L. 99-272 requires OTA to monitor certain Federal research activities related to women veterans.

OTA continues to appoint the members of the Prospective Payment Assessment Commission (ProPAC) and the Physician Payment Review Commission (PPRC). ProPAC is an independent advisory committee mandated under the Social Security Amendments of 1983 (P.L. 98-21, Section 601, 42 U.S.C. 1395ww) that reform the Medicare program payment method. The law requires the OTA Director to select the Commission members. The first Commissioners were appointed in 1983.

PPRC is also an independent advisory committee and was mandated by the Consolidated Omnibus Budget Reconciliation Act of 1985 (P.L. 99-272, 42 U.S.C. 1395w-1). PPRC's purpose is to advise Congress and the Executive Branch on possible ways of reforming physician payment under the Medicare program. The law requires the OTA Director to select the Commission members. Initial appointments to the 13-member Commission were made in 1986, for terms ranging from one to three years.

P.L. 99-960 and P.L. 102-507 also require the Director of OTA to appoint the members of the Advisory Panel on Alzheimer's Disease, which advises the Secretary of Health and Human Services on priorities and emerging issues related to Alzheimer's disease and related dementia. The first panel was appointed by the OTA Director in 1987, and the panel was reauthorized in 1992. The panel's authorization terminates in 1995.

Interagency Coordination

In carrying out OTA's mission as a shared resource of the committees of the Congress, our staff cooperate and interact extensively with congressional members and staff and with the staffs of other Federal agencies, the private sector, and institutions around the world. This extensive networking serves to avoid duplication and to increase Congress's analytical resource base as it enables OTA to utilize the most up-to-date information available. In particular, OTA and the three other analytical congressional support agencies have adopted processes that ensure fuller utilization of each other's expertise—in administrative as well as substantive areas. Senior staff from OTA, CRS, CBO, and GAO meet regularly to discuss topics on which each agency works, such as trade, education, health care, energy, agriculture, environment, transportation, and defense, in order to eliminate duplication and ensure that resources are devoted to each facet of an issue. Some recent examples of OTA networking that resulted in notable benefits to the Federal, State, and local government include:

- OTA hosted a sister agency coordination meeting attended by CBO, CRS, GAO and OTA staff to review ongoing and planned studies in the areas of energy, transportation, infrastructure, and science.
- Because of OTA's extensive prior work on the issue of federal coal leasing, OTA staff were consulted by GAO investigators in their review of the administration of the Federal Coal Management Program. OTA's 1986 report *Potential Effects of Section 3 of the Federal Coal Leasing Amendments Act of 1976—A Special Report* was cited as definitive by both GAO in its report Mineral Resources Federal Coal-Leasing Program Needs Strengthening (GAO/RCED-94-10) and by the Department of the Interior Solicitor's Office in its reply.
- The *Advanced Automotive Technologies* assessment is being conducted in close coordination with the Department of Energy (DOE) and the Office of Science and Technology Policy (OSTP), and both have formal observers on the assessment's advisory panel. OTA staff have met with DOE's Office of Transportation Technologies to discuss their work on vehicle materials and plan to meet to discuss overall US. R&D strategy for advanced vehicles.

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- OTA staff met with GAO staff to coordinate work on the OTA Background Paper *Studies of Environmental Costs of Electricity* and on issues covered in the ongoing renewable energy study.
- OTA staff met with CRS staff to discuss renewable energy budgets in connection with the OTA assessment of renewable energy.
- OTA staff working on the study of international collaboration in large science projects held extensive coordination meetings and consultation with staff at GAO and CRS on the scope of recent or ongoing work on big science, and energy research and development activities.
- OTA and CRS staff are closely coordinating work on fusion-related activities and a CRS staff member is contributing to OTA's background paper on fusion.
- The OTA fusion project team met with GAO staff to discuss their past and current reviews of the U.S. fusion energy program.
- OTA staff working on the OTA report *Federal Research and Technology for Aviation* briefed CRS staff on material in the OTA report related to their background paper on U.S. wind tunnels. They also summarized the material in the OTA report related to airport access regulations for GAO staff. In addition, OTA staff spoke with GAO staff about their airport pavement study and discussed some of the R&D needs identified in the OTA study.
- At the request of the National Research Council Aeronautics and Space Engineering Board, OTA staff working on the aviation study attended a meeting of the National Aviation Weather Service's Committee regarding aviation weather needs and possible integration of the National Weather Service and the FAA.
- OTA staff responded to a request by the National Aeronautics and Space Administration (NASA) Langley Research Center staff for recommendations for long-term R&D directions for NASA in support of their looking at an R&D priority process.
- OTA staff working on the renewable energy study served on a panel reviewing Department of Energy (DOE) utility dispatch and capacity modeling and conferred with DOE staff on several occasions regarding renewable energy use in buildings and utilities, and on energy costs.
- OTA staff working on the *Power Sources for Remote Power Applications* study coordinated with the Air Force regarding the status and progress of the Air Force's study of power technologies for the Burnt Mountain area in Alaska.
- At their request, OTA staff briefed DOE staff regarding the findings of the OTA Background Paper *Update on Energy Efficiency in Federal Facilities.*
- OTA staff were invited to participate in a review of the strategic plan for the U.S. Department of Energy's Office of Energy Management.
- Staff from the Environmental Protection Agency (EPA) Climate Wise program indicated that OTA's report on industrial energy efficiency provided them with the necessary technical substantiation to get the program started and that every firm that signs up for the program either gets a copy of the report or is urged to get one for themselves.
- OTA staff working on the earthquake damage mitigation study have met several times with the four agencies directly involved in earthquakes—the National Science Foundation (NSF), the U.S. Geological Survey (USGS), the National Institute for Standards and Technology (NIST), and the Federal Emergency Management Agency (FEMA), and made a presentation on the OTA study to the National Academy of Sciences' Seismology Committee.
- OTA staff working on the earthquake study have had considerable contact with OSTP (which is doing a study on the same topic). OTA staff attended an OSTP workshop on national earthquake strategy and user needs identification, briefed OSTP staff on the status, focus, and direction of the OTA study, and provided comments to the draft strategy in September 1994.

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- The project team for the OTA report *Fueling Reform: Energy Technologies for the Former East Bloc* met with the Department of Energy (DOE), Office of International Energy Relations staff to discuss options for shaping the IEA-sponsored Partners in Energy Efficiency Program (PIEE), targeted at Eastern Europe. OTA staff provided suggestions to DOE at this meeting, and OTA staff subsequently attended a workshop at DOE on July 20, 1994. OTA's work on energy supply and efficiency in former East Bloc countries provided invaluable insights in these scoping discussions.
- The U.S. Nuclear Regulatory Commission's proposed rule to revise its nuclear power plant license renewal regulations addresses some of the problems with the existing approach that OTA identified in the September 1993 report, *Aging Nuclear Power Plants: Managing Plant Life and Decommissioning* and that OTA staff had subsequently discussed with the Chairman and members of the Commission during an invited briefing.
- The OTA report *Energy Efficiency Technologies for Central and Eastern Europe* has influenced government policy at the Agency for International Development (AID), the Department of Energy (DOE) and the Office of Science and Technology Policy (OSTP).
- OTA's background paper *Biopolymers: Making Materials Nature's Way* has been useful in educating program directors in the principle funding agencies (the National Science Foundation, the Department of Defense, and the Department of Agriculture) about a new class of materials.
- The National Biofuels Roundtable (which includes participants from the Department of Energy, other executive agencies and the private sector) drew upon the OTA background paper *Potential Environmental Impacts of Bioenergy Crop Production* in their deliberations and in preparing their report.
- Staff of the U.S. Forest Service on assignment to the World Bank used and widely distributed the OTA background paper *Potential Environmental Impacts of Bioenergy Crop Production* for use in World Bank planning for the forestry and energy sectors in eastern Europe and the former Soviet Union.
- The White House advisory panel on transportation and global warming (CARTALK) distributed copies of the OTA report *Saving Energy in US. Transportation* to all of its members and is using the report in its evaluation of options.
- OTA hosted several meetings with representative staff from CRS, CBO, and GAO to discuss issues in education and employment of interest to Congress, and thereby to improve interagency coordination.
- In the fall and winter of 1993-94 OTA staff working on the teachers and technology assessment attended meetings of the National Coordinating Committee and Forum on Technology in Education and Training as they developed a position paper in calling for educational applications and use of the national information infrastructure (NII).
- OTA staff met with staff of the Department of Commerce, National Institute for Standards and Technology (NIST) in July 1994 to offer ideas for planning a workshop on developing a program on learning technologies in NIST's Advanced Technology Program. OTA staff attended the subsequent workshop on learning technologies and a meeting for Federal agency representatives.
- An OTA staff member is a member of the Technology Advisory Board for the National Center for Adult Literacy (NCAL), one the Department of Education's R&D Centers. The first meeting was held in June 1994.
- OTA staff worked with the Department of Education and the National Institute for Literacy in developing a greater outreach and mailing for the OTA report *Adult Literacy and New Technologies*. OTA also worked with the National Center for Adult Literacy in putting the Summary (with full text and graphics) of the report on adult literacy into a Mosaic file for distribution on the Internet.
- OTA worked very closely with GAO in preparation of the OTA report, *Technologies for Understanding and Preventing Substance Abuse and Addiction*, which was released in September 1994. OTA and GAO held a joint workshop to gather information on Federal drug demand reduction efforts, and OTA was represented at a GAO forum on GAO's overall response to congressional interest in studies related to addiction.

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- OTA staff continue to work closely with GAO for the study of eligibility criteria for long-term care, the study of client autonomy for long-term care, and the case management studies. The project director for these studies talks to GAO staff frequently about their long-term care work, and chaired a GAO meeting on case management in long-term care. OTA and GAO staff review each other's documents. The project director met with GAO to provide comments on two questionnaires on long-term care they developed this year. GAO staff attended OTA's workshops on the eligibility study and the client autonomy study.
- OTA staff for the study of eligibility criteria for long-term care have worked closely with staff of the Office of the Assistant Secretary for Planning and Evaluation (ASPE), U.S. Department of Health and Human Services (USDHHS), which is primarily responsible for the administration's long-term care policy work. One staff member from ASPE participated in OTA's workshop for the eligibility study. OTA staff participated in three formal meetings and numerous informal meetings with ASPE staff to discuss eligibility criteria for people with cognitive impairments.
- CRS relied, in part, on the background paper *Biomedical Ethics in U.S. Public Policy* when it issued its brief on the protection of human research subjects and the human radiation experiments. GAO is using the report as part of its investigation into past and current federal protection of human research subjects.
- The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) developed an implementation plan, along with a "public relations response" to the OTA report, *Harmful Non-Indigenous Species in the U.S.* The agency was repeatedly called upon by Congress to testify regarding its response.
- Seven Federal land management agencies signed a memorandum of understanding (MOU) on native plant conservation in 1994 and 17 federal agencies are expected to sign another MOU for a Federal Interagency Committee for the Management of Noxious and Exotic Weeds—a direct result of OTA's work on harmful non-indigenous species.
- The Denver regional office of the U.S. Environmental Protection Agency (EPA) used OTA's chapter on bioengineered organisms in the report on harmful non-indigenous species to address questions regarding unregulated nitrogen-fixing organisms, their potential spread from alfalfa to other legumes, and weediness—concerns so-far not addressed by EPA Headquarters.
- The USDA Soil Conservation Service used the harmful non-indigenous species report for their 1994 five-year assessment under the Resource Conservation Act.
- The Governor of California's San Francisco Bay Delta Oversight Council solicited OTA's review of their status report on non-indigenous species in the Bay.
- Maryland National Capitol Parks and Planning Commission is using OTA's material on harmful non-indigenous species to put together a nation-wide list of invasive plants.
- Several Federal government agencies responsible for addressing water and waste sanitation, particularly the U.S. Environmental Protection Agency and the U.S. Public Health Service, have used the OTA report, *An Alaskan Challenge: Native Village Sanitation*, for implementing their technical assistance and operations and maintenance efforts. The Indian Health Service and the National Aeronautics and Space Administration are also funding various demonstration projects involving some of the innovative technologies discussed in the report.
- The Commissioner of the Alaska Department of Environmental Conservation, the State agency responsible for providing sanitation services to Native Alaskans, has adopted the OTA report, *An Alaskan Challenge: Native Village Sanitation*, as the basis for coordinating all sanitation projects initiated by State or Federal agencies in Alaska. Use of the OTA assessment has also been reported by the Alaska Science and Technology Foundation, Village Safe Water, and several organizations of Alaskan Natives.
- The OTA aquaculture project staff helped GAO staff frame a response to a request from Senators Daniel K. Akaka and John Glenn, and Representatives Gerry E. Studds and E. (Kika) de le Garza for an analysis of the

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availability of commercial and federal financing for aquaculture enterprises, which resulted in GAO/RCED-94-69R "USDA Assistance for Aquaculture" (Nov. 5, 1993).

- OTA and GAO are currently coordinating complementary studies on the safety of rotary kiln incinerators.
- The Project Director of the OTA assessment Contributions of DOE Weapons Labs and NIST to Semiconductor Technology was a witness at the first meeting of the Secretary of Energy's Advisory Board Task Force on Alternative Futures for the Department of Energy National Laboratories. The chairman of the task force distributed copies of the OTA report to the task force members and recommended it to them.
- The report *Multinationals and the National Interest: Playing by Different Rules* has been used widely in the office of the U.S. Trade Representative (USTR), the OSTP, the Department of Commerce Technology Administration, and other Executive offices to help refine their understanding of trade, investment, and technology policy issues and to address related policy problems.
- The U.S. Customs Service has used *Multinationals and the National Interest* in their investigation of intrafirm trade and to educate Customs agents on associated policy issues.
- Based on their work on the report Industry, Technology and the Environment, OTA staff participated in a workshop sponsored by the U.S. Agency for International Development (AID) to define the U.S.-Asia Environmental Partnership's role in promoting pollution prevention. (US-AEP is an interagency public-private initiative to promote environmental technology cooperation and U.S. exports to the Asia-Pacific region.)
- OTA staff participated in the interagency Defense Conversion Roundtable meetings. The Roundtable is an interagency discussion group of research staff from the legislative support agencies.
- The National Institute of Standards and Technologies (NIST) relied extensively on the report Industry, Technology, and the Environment in formulating its draft environmental strategy for its manufacturing extension partnership. The strategy calls for much more integration of pollution prevention and other environmental services with manufacturing extension services (an option explored in detail in the OTA report). NIST's manufacturing extension partnership is seeking a partnership with EPA to further this end at 25 to 30 manufacturing extension centers.
- According to Department of Energy (DOE) officials, the Industry, Technology and the Environment report has given added momentum to efforts within DOE to 1) eliminate the energy savings requirement in waste minimization projects conducted by DOE's Office of Industrial Technologies so it can fund projects with greater environmental benefit, and 2) give more emphasis to industrial consortia. In addition, a high ranking DOE official has used the report's discussion of the need for better coordination within DOE and between DOE and other agencies to push for better coordination within DOE.
- The U.S. International Marketing Center of the U.S. Embassy in England is using Industry, Technology and the Environment to assist U.S. environmental businesses in developing export strategies to the U.K. and Europe. The report was also used at the European Environmental Initiative Conference, a ministerial level meeting sponsored by the U.S. Embassy and the British and German Environmental Ministries.
- The Department of Commerce and the Organization for Economic Cooperation and Development (OECD) made extensive use of the Industry, Technology and the Environment report in preparation for OECD meetings on the environment industry in the Fall of 1994. The Commerce Department sought the input of OTA staff in commenting on OECD questions to member states about the environment industry, and made extensive use of OTA analyses in the U.S. Government's submittal to OECD. OECD also invited a project staff member to serve as an expert participant at one of the Fall meetings.
- Prominent members of the chemical manufacturing community are promoting a Chemical Industry Environmental Technology Partnership, drawing upon an option in Industry, Technology and the Environment for industry consortia for environmental R&D.

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- The major background paper *Development Assistance, Export Promotion and Environmental Technology* was extensively relied upon in the U.S. Government's initial report to the UN Commission on Sustainable Development.
- A congressionally-mandated classified study of cryptography to be conducted by the National Research Council (NRC) has used the OTA report *Information Security and Privacy in Network Environments* to identify issues to be addressed in the NRC study. OTA was asked to brief the distinguished panelists who will be conducting the study on behalf of the NRC.
- An ongoing OTA study, *Information Technologies for Control of Money Laundering*, that was requested by the Senate Committee on Governmental Affairs is being closely coordinated with work on money laundering being conducted by GAO. In that way the strengths of both agencies will be brought to bear on the issue.
- The OTA assessment of the Social Security Administration's plans for extending electronic services through computer workstations and electronic networks was coordinated with GAO, and resulted in persuading the House Appropriations Committee to act cautiously and contain appropriated funds until the planning deficiencies are remedied.
- Discussions are underway with GAO and CBO on the assessment of the space launch vehicle industry.
- OTA staff responsible for the report *Proliferation and the Former Soviet Union* coordinated closely with GAO personnel assigned to work on what initially appeared to be a very similar study. As a result of the discussions, the GAO study was recast to avoid duplication, concentrating on details concerning the Russian system of nuclear material accountancy and control. These were highlighted as important in the OTA report, which was not able to cover them in detail.
- Throughout FY 1994, a series of information meetings with GAO, CBO, and CRS were held regarding OTA's Earth Observations assessment.
- OTA and CRS published a joint study, *Universal Health Insurance and Uninsured People: Effects on Use and Cost*, in August 1994.
- Based on the OTA background paper *Psychiatric Disabilities, Employment, and the Americans With Disabilities Act*, the U.S. Equal Employment Opportunity Commission (EEOC) solicited OTA input to update the database they maintain on charges of discrimination under the Americans With Disabilities Act (ADA). The existing database had been inadequate in terms of the information collected on mental disorder-based disabilities.
- During the OTA assessment *Understanding Estimates of National Health Expenditures Under Health Reform*, OTA coordinated extensively with CBO, the office of the Assistant Secretary for Planning and Evaluation within HHS, and OMB. Information from the study was also provided to the House Budget Committee and the Senate Republican Task Force on Health Care Reform. OTA staff also provided extensive comments on early drafts of a report from the GAO on administrative costs and health reform.
- OTA staff working on the assessment on medical workforce reform have been involved in the activities of several foundations and associations dealing with this issue, including the W.K. Kellogg Foundation, the Josiah Macy, Jr. Foundation, Pew Charitable Trusts, and the Robert Wood Johnson Foundation. The Milbank Memorial Fund of New York has involved OTA staff in several workshops on physician supply.
- The Association of Academic Health Centers has involved OTA staff in its Health Workforce Policy Project, a series of workshops funded by the Josiah Macy, Jr. Foundation.
- OTA staff are also participating in a series of meetings entitled "Challenging the Health Care Workforce to Meet the Challenges of Reform" co-sponsored by the W.K. Kellogg Foundation, the Pew Charitable Trusts, and the Robert Wood Johnson Foundation. The purpose of these meetings is to convene key public policymakers and research and demonstration project directors to discuss the implications of what they have learned for national policymaking concerning health care workforce and primary care development.

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- Based on the OTA report, *Pharmaceutical R&D*, OTA staff were requested by CRS and CBO to review and critique the drafts of every report on the pharmaceutical industry dealing with pricing, market structure or research and development.
- Following up on the OTA background paper, *Costs and Effectiveness of Colorectal Cancer Screening in the Elderly*, OTA staff served on a working group whose purpose was to advise the Centers for Disease Control (CDC) in the Public Health Service, on a strategy for preventing colorectal cancer. OTA staff also served on an NCI study section review panel for grants in the area of colorectal cancer control.
- In conducting research on the OTA assessment of dietary supplements, OTA has regularly shared information and coordinated activities related to dietary supplements with CRS. The work that both OTA and CRS are doing stems from complementary mandates in the Dietary Supplement Act of 1993. Coordination with GAO, which also was mandated to do work on this issue, also has taken place.
- OTA is relied upon by a variety of other congressional bodies and executive branch agencies in their work regarding methods and programs for health technology assessment. OTA staff have participated in several discussions on the basic concepts of technology assessment with CRS staff who are beginning to work in this area. Staff from PPRC, AHCPR, GAO, NIHM and other entities routinely call upon OTA staff for assistance on this topic. Members of OTA staff have given numerous presentations on medical technology to these groups, and also have participated on panels, workshops and study groups addressing various aspects of technology and its evaluation.
- OTA is also a charter member of an international collaboration called the International Network of Agencies for Health Technology Assessment. This group consists of government bodies responsible for medical technology assessment, and is developing a database of ongoing studies to allow better information sharing and reduced duplication of work. The group also plans to promote sharing of technical and methodological expertise.
- An OTA staffer serves as a member of the National Institute of Arthritis and Musculoskeletal and Skin Diseases' "National Osteoporosis Data Group," which meets regularly to identify data needs for osteoporosis. OTA's work on osteoporosis has identified many unanswered questions about prevalence and impacts of osteoporosis and is one primary reason for the establishment of this group.
- As a result of the 1992 OTA report *Special Care Units for People with Alzheimer's and other Dementias*, an OTA staff member serves as a member of the National Advisory Board for the National Institute on Aging's research project, Collaborative Studies on Special Care Units for Alzheimer's Disease. OTA's work on special care units was one reason for the initiation of the NIA project, and the 1992 report remains a reference for this group.
- OTA staff working on health issues related to Persian Gulf veterans provided ongoing feedback to the Institute of Medicine (IOM) committee reviewing information about reports of health problems in Persian Gulf military personnel. The OTA report and contractor papers on the VA and Department of Defense activities regarding the Persian Gulf were used by the IOM committee in their work. Similar information was also supplied to staff from GAO, CBO and CRS.

6. Changes in OTA's Prior Plans for FY 1994

During FY 1994, OTA essentially accomplished its goals, with approved modifications, negotiated reductions in some projects, and additions to others to meet the changing needs of Congress and to accommodate the inherent uncertainty of research. The chart below shows the variations in actual obligations for the OTA divisions for FY 1994 from the planned obligations for FY 1994 provided on Schedule A in the FY 1995 budget justification. Funding shifts were made between the divisions as a result of the program reorganization which took place during the year. The chart below provides a summary by object class of projects and actual expenditures for FY 1994.

10.3. Role of the Industry, Commerce, and International Security Division

The Industry, Commerce, and International Security Division comprises 3 research Programs: **Energy, Transportation, and Infrastructure; Industry, Telecommunications, and Commerce**; and **International Security and Space.**

The **Energy, Transportation, and Infrastructure (ETI) Program** is responsible for examining the role of technology in extracting, producing and using energy resources; designing, operating, and improving transportation systems; and planning, constructing, and maintaining infrastructure. The Program addresses the impacts of these technologies and the factors that affect their ability to support commerce and other societal goals. Applications of materials to energy, transportation, and infrastructure systems, including the development of natural and manufactured material resources through extraction, processing, use, and recycling or waste management, are included in ETI's work. The Program's work also covers the export and import of energy, transportation, and infrastructure technologies, goods, and services, including energy fuels and efficiency, and the implications of these activities for economic growth, global competitiveness, and international stability.

The **Industry, Telecommunications, and Commerce (ITC) Program** is responsible for assessments on technology and international industrial competitiveness, telecommunications and computing technologies, international trade, industry productivity, and related topics. ITC examines how technology affects the ability of U.S. industry to contribute to a healthy national economy. This includes consideration of the role of technology on competitiveness of U.S. industries in international markets; trade and economic development issues; the changing role of telecommunications and computing technologies in the nation's industry, commerce, and government; the effect of technology on the number and nature of employment opportunities in the U.S. economy; the effects of technological change on jobs and training; and ways to ease adjustments in structural economic transitions brought about by technological change. The Program also studies telecommunications regulation, information policy, and applications of information technology in the public sector.

OTA's work concerning technological aspects of national security, international security (as it concerns the U.S.), and space is pursued in the **International Security and Space (ISS) Program**. The program's security work focuses on implications of technology and technological change for national defense as well as international stability, arms control, arms proliferation, terrorism, and alliance relations. Assessments of issues related to the nation's defense industrial and technology base is an increasing part of ISS's work. The program's space work involves a broad range of issues, such as space transportation, earth observation, international cooperation and competition, exploration, use, and commercialization of space. The program's work has also ranged into areas such as law enforcement.

10.4 Accomplishments of the Industry, Commerce, and International Security Division

In FY 1994, the Industry, Commerce, and International Security Division published 13 assessment reports:

Industry, Technology and the Environment
The Social Security Administration's Decentralized Computer Strategy
Electronic Enterprises: Looking to the Future
Export Controls and Nonproliferation Policy
Fueling Reform: Energy Technologies for the Former East Bloc
Saving Energy in U.S. Transportation
Information Security and Privacy in Network Environments
Proliferation and the Former Soviet Union
Remotely Sensed Data: Technology, Management, and Markets
Civilian Satellite Remote Sensing: A Strategic Approach

Assessing the Potential for Civil-Military Integration: Technologies, Processes, and Practices
Federal Research and Technology for Aviation
Multinationals and the U.S. Technology Base

The Division also published 6 background papers:

Global Change Research and NASA's Earth Observing System
Technologies Underlying Weapons of Mass Destruction
Energy Efficiency in Federal Facilities: Update in Funding and Potential Savings
Power Sources for Remote Arctic Applications
Studies of the Environment Costs of Electricity
Virtual Reality and Technologies for Combat Simulation

In addition, the Division testified 12 times.

Listed below are several examples of direct legislative use of the Division's work:

Energy, Transportation, and Infrastructure

1. The OTA report, *Green Products by Design* and some of its findings were cited in House Report 103-536 on H.R. 3870, the Environmental Technologies Act of 1994, as was testimony by OTA staff before the House Science, Space, and Technology Committee's Energy Subcommittee.
2. The aviation project staff provided staff of the House Science, Space, and Technology Committee with information on potential new aeronautics initiatives for NASA 3-5 years from now.
3. The OTA background paper *Power Sources for Remote Arctic Applications* was used as background information in connection with the defense appropriations process.
4. Materials and discussions presented at an OTA workshop on the fusion energy program were considered by congressional staff as background information in connection with proposed legislation (H.R. 4564, H.R. 4908).
5. The aviation project staff briefed congressional committee staff on analysis and findings in *Aircraft Evacuation Testing* Background Paper, which was helpful in subsequent decisions regarding possible introduction of legislation on the 60-second evacuation rule (i.e., shortening time in which demonstration for aircraft certification must be completed).

Industry, Telecommunications, and Commerce

1. H.R. 3813, the Environmental Export Promotion Act of 1994 (passed by the House on April 19, 1994) reflects the findings of the OTA report *Industry, Technology and the Environment: Competitive Challenges and Business Opportunities*. Specifically, the bill requires closer coordination of Federal export promotion programs with State and local agencies, and seeks to build expertise in environmental technology in our overseas missions.

   Congressman Gilman (the ranking Republican member of the House Foreign Affairs Committee, which reported the bill) said: "This legislation enacts proposals contained in the industry, technology and environment study undertaken by the Office of Technology Assessment and directs the administration to create regional environmental initiatives." Also, Rep. Toby Roth (the Republican floor manager for the debate) said: " Our bill reflects the findings of two recent authoritative reports: One by the Office of Technology Assessment, the other by an interagency group headed by the Commerce Department."
2. The House Science, Space, and Technology Committee found OTA's report, *Industry, Technology and the Environment: Competitive Challenges and Business Opportunities*, helpful in drafting H.R. 3870, the proposed Environmental Technologies Act of 1994. OTA was twice asked to testify by the House Science,

Space, and Technology subcommittees on draft versions of the legislation from the standpoint of the findings and policy options discussed in the OTA report. The Committee report on the bill frequently cited OTA's Industry, Technology and Environment report, with the majority of the Committee's four page background discussion for the bill depending heavily on the findings of the OTA report.

3. Consistent with the findings of OTA work on pollution prevention and with comments by OTA staff, S. 978 (the proposed National Environmental Technologies Act) as reported by the Senate Environment and Natural Resources Committee, reflected changes to explicitly emphasize pollution prevention/cleaner production. In supporting S. 978 on the floor, Sen. Lieberman cited OTA findings in its report, *Industry, Technology and the Environment*, on the competitiveness of U.S. suppliers of environmental technologies, and quoted from the report on the importance of integrating pollution prevention and environmental assistance into manufacturing assistance programs.

4. The Environment and Public Works Committee report on S. 1093 the Water Pollution Prevention and Control Act of 1994 quoted from the report *Industry, Technology and the Environment* on the need for technical assistance to enable small and medium sized firms to identify and implement pollution prevention measures. The Committee report also quoted from the OTA report on the need for better integration of environmental assistance with manufacturing assistance.

5. Representative Kanjorski introduced H.R. 3550 dealing with commercialization of Federal technologies. Program staff had worked with his staff over a number of months, providing information on federal technology transfer efforts; program staff also testified at a hearing held by Mr. Kanjorski. Parts of the bill draw from OTA findings—e.g., rather than creating a new data base, the bill proposes to develop better information about current efforts and then build on what is already out there.

   The legislation allows the Department of Commerce (DOC) to delegate administrative functions of a technology data base to other entities (such as the National Technology Transfer Center). In addition, the legislation calls on DOC to issue a report detailing Federal technology transfer efforts and to develop a plan to eliminate redundancy.

6. The markup of the Economic Development Administration (EDA) reauthorization bill by the House Committee on Banking, Finance and Urban Affairs, Subcommittee on Economic Growth and Credit Formation incorporated a number of options OTA suggested (based in part on its work *After the Cold War: Living with Lower Defense Spending*) in informal conversations and in testimony to the Committee. For example, they included language to create an Office of Strategic Planning and Policy in EDA, based on an option with the same name in OTA's testimony of March 22, 1994.

7. *After the Cold War: Living with Lower Defense Spending* (ACW) pointed out that a barrier to timely and effective economic development and reuse after base closures were the provisions in the McKiney Act that homeless organizations have first rights to property on bases and can exercise those rights at any time in the closure/redevelopment process. One policy option in ACW suggested that Congress might want to put time limits on the rights of homeless organizations to property, or perhaps move communities to the front of the line. This options was adopted by the Senate Democratic Defense Conversion Task Force chaired by Sen. Pryor, and was reflected in this year's Defense Authorization bill. The bill essentially exempted bases from the McKiney Act, and incorporated new procedures that require community redevelopment organizations (responsible for base reuse) to negotiate and cooperate with homeless organizations, consistent with a number of suggestions OTA made on the need for partnerships among the various players at the local level.

8. The proposals on competitiveness in the legislative agenda of the Northeast-Midwest Coalition draw heavily from *Making Things Better: Competing in Manufacturing* (MTB). Consistent with the taxonomy in MTB, their action categories address financing, technology transfer, and worker training and workplace issues. Their proposals in the latter category also draw from the report *Worker Training: Competing in the New International Economy* (WT).

9. Rep. George Brown, in reporting to the Subcommittee on the Legislative Branch of the Committee on

Appropriations, described the report *Competing Economies: America, Europe and the Pacific Rim* as "one of the seminal documents in Congress's consideration of ways to improve our competitive posture." Mr. Brown continued, referring to more recent work as "giving us precise analysis about how to convert our economy in a post Cold war environment.... I would call your particular attention to OTA's outstanding work on evaluating the national laboratories role in our economy." The defense conversion work Mr. Brown referred to is contained in three OTA reports: *After the Cold War: Living with Lower Defense Spending*; *Defense Conversion: Redirecting R&D; Contributions of DOE Weapons Labs and NIST to Semiconductor Technology.*

10. Based on the report *Defense Conversion: Redirecting R&D*, OTA assisted the House Energy and Commerce Committee, Energy and Power Subcommittee, to plan a hearing on the future of the DOE labs.
11. *Information Security and Privacy in Network Environments*, a report released in September 1994, received immediate attention by the Senate Committee on Governmental Affairs. Upon its release, Senators Glenn and Roth announced their intentions to hold oversight hearing on U.S. cryptography policy and to propose amendments to the Computer Security Act and the Computer Privacy Act.
12. A report on the *Electronic Enterprise*, an assessment of the role of telecommunications and information technologies in business and commerce has stimulated further thinking among congressional clients about how these technologies might be included in further legislation to promote the competitive position of the United States business community.
13. An OTA assessment of the Social Security Administration's plans for extending electronic services through computer works stations and electronic networks, *The Social Security Administration's Decentralized Computer Strategy*, directly impacted the appropriation of fiscal 1994 through 1996 money toward the estimated $1.25 billion cost for the system in out years. The report, which was requested by the House Committee on Appropriations, asked OTA to evaluate the SSA deployment and operational plans for the system, and provide the Committee information to guide its decision on near term appropriations. OTA found some deficiencies in SSA's planning, which agreed with some preliminary work conducted by GAO that indicated deficiencies as well.
14. The OTA report, *Making Government Work*, influenced the drafting of S. 1646, "Food Stamp Fraud Reduction Act of 1993." The section of the report on electronic benefit transfers (EBT), a technology that can replace food stamp coupons with electronic transactions, was cited in introductory statements with the bill. The report also was influential in administrative actions to improve the food stamp program within the Executive Branch, including the OTA strategy to scale up regional testing of EBT.
15. Several options offered in the OTA report *Making Government Work* were adopted in S. 560, "Paper Work Reduction Act of 1994," including information dissemination strategies, improving government information resource management and linking it to agency performance criteria, and developing a government information locator. Within the Federal government, there are a number of instances where the OTA Report has been used as a manual for agency information and service operations. S. 560 was passed by the Senate in 1994, but remained pending in the House of Representatives at the end of the 103d Congress. S. 1782, the "Electronic Freedom of Information Improvement Act of 1993" was reported from the Senate Committee on the Judiciary, but no action was taken in the companion bill in the House. This bill was based heavily on two OTA reports, *Making Government Work*, and *Informing the Nation*, both dealing with the use of electronic information technology to improve government services and dissemination of information.

International Security and Space

1. The report *Redesigning Defense* had an impact on the development of amendments to the Defense Production Act in 1992, particularly regarding the evaluation of the domestic industrial base. The report findings and those of the subsequent report, *Building Future Security*, had a major effect on the portion of the Defense Authorization Act for FY 1993 dealing with preservation of the industrial base and DTIB (defense technology and industrial base) planning to support U.S. national security objectives (Chapter 148). This legislation

was a major development and continues to drive the Department of Defense (DOD) DTIB planning and reporting, although it is only recently that DOD has responded with the initial report due 6 months (early 1993) after passage of the legislation. The OTA report is still being used in Congress and in industry as the best single outline to future defense technology and industrial base needs and an outline of ways to fill those needs.

2. The report *Building Future Security* directly affected the FY 1993 Defense Authorization Act (see above). It also affected the Federal Acquisition Streamlining Act of 1994 (FASA) since it was used as a part of the argument for acquisition reform, but it is difficult to point to an exact section of FASA. How this report and the first report have been used is complex. They have been used by DOD and trade associations to make policy arguments about change, they have been extensively used by the DOD to help write overall defense industrial strategy and been used by Congress to shape legislation. For example, while *Redesigning Defense* was used by DOD to develop Secretary of Defense Cheney's new industrial base policy and policy statement, *Building Future Security* was used (and continues to be used) by industry to support argument for changes in depot level maintenance.

3. The OTA report, *Export Controls and Nonproliferation Policy*, was released and delivered as the House and Senate Committees were marking up and reporting out their respective versions of the Export Administration Act, which governs U.S. export controls on technology that could be used to make weapons of mass destruction. The options and analyses in this report bear directly upon the work these Committees were doing to reauthorize the Export Administration Act.

4. The report, *Proliferation and the Former Soviet Union*, was released by the House Armed Services Committee (together with the Senate Committee on Governmental Affairs), which used the report to urge that the defense appropriations conference committee, which was meeting at the time on the FY 1995 Defense Appropriations Bill, provides full funding for Nunn-Lugar programs. These programs provide assistance for managing nuclear weapons, nuclear materials, and sensitive exports in the former Soviet Union. The conference ended up fully funding the $400,000,000 requested for Nunn-Lugar programs for FY 1995.

5. *Proliferation and the Former Soviet Union* is being used by the Permanent Subcommittee on Investigations of the Senate Committee on Governmental Affairs to help plan the Committee's investigation of Russian organized crime, particularly its connection with the smuggling of nuclear materials.

6. OTA's report, *Verification Technologies: Managing Research and Development for Cooperative Arms Control Monitoring Measures* (May 1991), pointed out that the U.S. lacked "a synoptic, long-term program of research on cooperative measures of arms control verification in part because there is no one in charge..." The Arms Control and Nonproliferation Act of 1994 (Nuclear Proliferation Prevention Act of 1994), contained in Pub. L. 103-236, Section 711, calls for a report by the Director of the United States Arms Control and Disarmament Agency with respect to the procedures established pursuant to section 35 of the Arms Control and Disarmament Act (22 U.S.C. 2575) for the effective coordination of research and development on arms control, nonproliferation, and disarmament among all departments and agencies of the executive branch of the U.S. Government. (One option in that report was the revitalization of ACDA to carry out that mission. The law also called for the ACDA Director to submit to Congress a report on the revitalization of ACDA.) The Defense Appropriations Act of 1995 (P.L. 103-335), Section 8092, calls for a report providing the following information about all research and development projects involving the implementation, monitoring, or verification of current and projected international arms control agreements: (a) annual and total budgets, goals, schedules, and priorities; (b) relationships among related projects being funded by the Department of Defense, the National Foreign Intelligence Program, and other departments and agencies of the Federal Government; and (c) comments by the Arms Control and Disarmament Agency about the relevance of each project to the arms control priorities of the United States.

7. The wording of H.R. 4489 and Report 103-654 were influenced by the OTA reports, The Future of Remote Sensing from Space, and Remotely Sensed Data: Technology, Management and Markets.

11.3. Role of the Health, Education, and the Environment Division

The Health, Education, and the Environment Division comprises three programs: **Education and Human Resources, Environment, and Health.**

The **Education and Human Resources (EHR) Program** is responsible for studies of technologies for learning, and of science-grounded human resource topics. Education studies critically examine technologies of all kinds, for learners of all ages and abilities, and in all settings. Human resources studies deal with the costs, availability, effectiveness, and impacts of technologies in areas such long term care and disability services, housing for people with disabilities, prevention of drug abuse, and issues of crime and violence.

The **Environment Program** assesses scientific, technical, and policy issues related to the environment. Program areas include the use and conservation of renewable resources; pollution prevention, control, and remediation; and environmental health and risk management. Assessments have focused on such topics as agriculture; management of public lands; biological diversity; risk assessment methods and policy; air and water pollution; management of solid, hazardous, and nuclear wastes; and the effects of weather and climate change.

The **Health Program's** charter is reflected in three primary types of efforts: 1) assessments of specific clinical and general health care technologies, 2) studies of broader issues of health policy related to or with implications for technology, and 3) studies of applications, particularly to human health, of the biological and behavioral sciences (including biotechnology, human molecular genetics, neurological sciences, and health-related behaviors). The Program also is responsible for OTA's statutory, methodology oversight responsibilities regarding Vietnam veterans health studies

In addition, the Division provides the staff work for the OTA Director's mandated responsibility to select and appoint members of the Prospective Payment Assessment Commission, the Physician Payment Review Commission, and the Advisory Panel on Alzheimer's Disease.

11.4 Accomplishments of the Health, Education, and the Environment Division

In FY 1994, the Health, Education, and the Environment Division published 9 assessment reports:

Researching Health Risks
Preparing for an Uncertain Climate, vol. 1
Preparing for an Uncertain Climate, vol. 2
An Alaskan Challenge: Native Village Sanitation
Understanding Estimates of National Health Expenditures Under Health Reform
Defensive Medicine and Medical Malpractice
Technologies for Understanding and Preventing Substance Abuse and Addiction
Identifying Health Technologies That Work: Searching for Evidence
Perspectives on the Role of Science and Technology in Sustainable Development

The Division also published 21 background papers:

International Health Statistics: what the Numbers Mean for the United States
Psychiatric Disabilities, Employment and the Americans with Disabilities Act
Testing and Assessment in Vocational Education
Technical Options for the Advanced Liquid Metal Reactor
Wage Record Information Systems
Climate Treaties and Models: Issues in the International Management of Climate Change
Managed Care and Competitive Health Care Markets: The Twin Cities Experience
Universal Health Insurance and Uninsured People: Effects on Use and Cost
Understanding Estimates of the Impact of Health Reform on the Federal Budget

OTA Review: The Medical Follow-Up Agency
Public Information About Osteoporosis: What's Available, What's Needed?
Tools for Evaluating Health Technologies—5 Background Papers
Using Patients' Reports to Evaluate Medical Outcomes
Large Administrative Database Analysis
Large and Small Randomized Trials
Meta-Analysis
Clinical-Economic Trials
The Department of Defense Kuwait Oil Health Fire Risk Assessment (The "Persian Gulf Veterans' Registry")
International Comparisons of Administrative Costs in Health Care
Mental Disorders and Genetics: Bridging the Gap Between Research and Society
Health Care Technology and Its Assessment in Eight Countries
External Review of the Federal Centers for Disease Control and Prevention's HIV Prevention Programs

In addition, the Division testified 23 times.

Listed below are several examples of direct legislative use of the Division's work:

Education and Human Resources

1. Congressional staff preparing for the reauthorization of the Carl D. Perkins Vocational and Applied Technology Education Act have expressed the importance of OTA's 1993 *Adult Literacy and New Technology* study to their preliminary deliberations on adult education. In addition, constituent groups are planning to use findings in the *Adult Literacy and New Technology* study as a basis for a strong push for greater support of technology in reauthorization. Congressional staff have asked GAO to update some of the basic statistics originally developed for OTA's *Adult Literacy and New Technology* study.
2. The congressionally mandated demonstration project of community systems for connecting people with dementia to appropriate services, which was based on the 1990 OTA report, *Confused Minds, Burdened Families: Finding Help for People With Alzheimer's and Other Dementias*, has been expanded to include more states with increased funding.
3. With enactment of the omnibus crime bill, legislation to set quality assurance standards for forensic DNA facilities and to provide guidelines for forensic DNA data banks became Public Law 103-322 on September 13, 1994. Both issues were identified by the OTA report, *Genetic Witness: Forensic Uses of DNA Tests*, and in previous Congresses OTA had worked on the legislation with the staffs of both the House and Senate sponsors—Representative Don Edwards, Chairman of the Subcommittee on Constitutional and Civil Rights, Committee on the Judiciary and Senator Paul Simon, Chairman, Subcommittee on the Constitution, Committee on the Judiciary. (Both chambers passed legislation in the 101st and 102nd Congresses that was not enacted when the crime bills in those Congresses failed.)
4. The OTA report *Cystic Fibrosis and DNA Tests: Implications of Carrier Screening* has affected ongoing congressional interest in the National Institutes of Health (NIH) and Department of Energy (DOE) Ethical, Legal, and Social Issues (ELSI) Programs of the Human Genome Project. Specifically of interest is whether the ELSI programs and their oversight Working Group are adequate policy mechanisms. In the past, report language has been associated with the NIH appropriations bill by Representative David Obey (who endorsed the undertaking of this report). More recently, the House Committee on Science, Space, and Technology, Subcommittee on Energy has increased its attention to DOE's component.
5. The legislative impact of the OTA background paper, *Biomedical Ethics in U.S. Public Policy*: Senator Mark O. Hatfield introduced S. 1042 to establish an Ethical Advisory Board. With the news of the human radiation experiments in late December 1993, congressional attention turned to hearings related specifically to the experiments, as well as to the issue of bioethics commissions generally. OTA provided assistance (witnesses

and background material) to the House Committee on Science, Space and Technology; the House Veterans' Affairs Committee, the House Committee on Government Operations, the Senate Committee on Labor and Human Resources, the Senate Committee on Government Affairs, the Senate Armed Services Committee, the Senate Veterans' Affairs Committee. Questions related to the federal implementation of regulations to protect human research subjects were provided to the Senate Committee on Government Affairs and were used to draft inquiries to executive branch; investigation still ongoing. OTA reviewed draft legislation to create a new bioethics commission for Senator Kennedy, Committee on Labor and Human Resources and Senator Hatfield, Committee on Appropriations.

6. The House Government Operations Committee, which requested the report Technologies for *Understanding and Preventing Substance Abuse and Addiction*, informs OTA staff that the report will be carefully studied for potential reauthorization of the Office of National Drug Control Policy (ONDCP) during the 104th Congress. OTA staff may be asked to testify. Legislation on ONDCP (H.R. 1926) passed the House during the 103rd Congress, but no final action occurred in the Senate.

Environment

1. The OTA report *Dismantling the Bomb and Managing Nuclear Materials* has been used to help develop a major initiative within the Department of Energy (DOE) and other agencies of the Administration regarding a plan and national policies on the disposition of weapons materials from dismantled nuclear warheads. OTA participated in Administration meetings to develop a national plan and provided DOE officials with supporting data. In July the DOE began a process to develop a programmatic environmental impact statement for "Long-Term Storage and Disposition of Weapons-Usable Fissile Materials" and OTA's work was key to many of the options considered as well as the methods proposed.
2. Following OTA's testimony before the House Natural Resources Committee in March 1994 on outside regulation of the Department of Energy (H.R. 3920), committee staff consulted with OTA staff regarding proposals from the administration to undertake an independent regulatory review itself. Subsequently the Committee deferred further action on H.R. 3920 and DOE began to establish an advisory commission. OTA then consulted with DOE and the new director of the commission regarding key issues to investigate and organizations and experts to involve in the process.
3. OTA provided information at the request of the House Science, Space, and Technology Committee on the subject of environmental technology development, the adequacy of funding and the direction of priorities within the Department of Energy that was used in developing proposed legislation known as "The Environmental Technologies Act of 1994."
4. During the development of legislation to amend the Superfund law (CERCLA), the House Energy and Commerce Committee, Subcommittee on Energy and Power asked OTA for assistance to review the issue of setting a single national goal for human health risks from both radioactive and non-radioactive hazardous materials contamination. OTA reviewed the question (using information from its past assessments) of whether there was a scientific basis for treating risks from different sources the same or differently and reported the data to the committee staff.
5. The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 established a federal interagency task force and stipulated that the task force make policy recommendation to Congress. The task force's draft report was circulated in April; it clearly showed the impact of OTA's work in the overlap in definitions, findings, and options.
6. At hearings of the Senate Governmental Affairs Committee in March 1994, OTA staff and four of OTA's advisory panelists were witnesses. During the hearing, Senator Akaka quoted from the *Harmful Non-Indigenous Species* report extensively and witnesses made repeated referrals to the report, including Howard Singletary's comment "OTA provided an excellent blueprint [for policy changes], well founded, well thought

out, and generally supported." Advisory panelist Don Schmitz: "OTA brought it together, especially for resource managers." Senator Akaka's provision for a law enforcement task force on non-indigenous animals and plants in Hawaii was included in the final 1994 Crime Bill, which passed in September 1994.

7. A broad coalition of congressional staff and non-governmental representatives discussed amendments to the Federal Noxious Weed Act in the spring of 1994. Preliminary hearings were held in the House Agriculture Committee, June 1994, with an advisory panelist from the *Harmful Non-Indigenous Species* report testifying. The coalitions amendments—which match OTA's suggestions—may be introduced in the 1995 Farm Bill. Also, the 7-state Inter-mountain Noxious Weed Advisory Council used OTA's report for background when they held a week of meetings with Members and staff on these same amendments.

8. The release of the OTA background paper *Technical Options for the Advanced Liquid Metal Reactor* coincided with a debate involving Congress, the Administration, and the Department of Energy (DOE) on the future of the Advanced Liquid Metal Reactor (ALMR) experimental nuclear reactor project. A similar debate was seen last year when Administration efforts to cut the research program were thwarted when the FY 1994 Energy and Water Appropriations conference committee provided essentially full funding even though earlier in the year the House had voted to cancel it. In the FY 1995 Energy and Water Appropriation bills the House version again followed the Administration's lead calling for an immediate shut down of the project while the Senate's version was considerably more generous. This year, following release of the OTA background paper in May, the House and Senate Conferees issued a report in August that included $83 million to shut down the ALMR program immediately instead of continuing research during four years of phase out as called for in the Senate bill. During this debate OTA staff were asked to discussed material from the background paper with staff from the offices of representatives Markey, and Senators Levin, Craig, and Kerry, as well as staff from the House Energy and Power Subcommittee.

9. The *Researching Health Risks* report was referenced in H.R. 4306, the Risk Assessment Improvement Act. The report was used in shaping the thinking on H.R. 2310, the Risk Communication Act.

10. Information presented by the offshore aquaculture project during a briefing for staff of the House Committee on Merchant Marine and Fisheries was used in development of legislation establishing a regulatory policy for marine aquaculture in Federal waters (H.R. 4853).

11. *An Alaskan Challenge: Native Village Sanitation*: Senator Stevens introduced an amendment to H.R. 4624, the Department of Veterans Affairs and Housing and Urban Development appropriations bill for FY 1994, requesting $15 million for improving water and sanitation projects among Alaska's rural Native communities. The bill, along with Senator Stevens amendment, was passed by Congress and signed by the President as P.L. 103-327.

Health

1. OTA's work on the ADA and mental illness contributed to the National Institute for Disability and Rehabilitation Research's (NIDRR's) (in the Department of Education) funding of two research projects on employment and mental illness. Also, the OTA background paper contributed to the CMHS' funding of research demonstration projects on employment and mental illness.

2. *Pharmaceutical R&D: Costs, Risks and Rewards*: As a result of this study, OTA was ready to provide analyses of the impacts of various approaches to funding a Medicare Prescription drug benefit under health care reform. OTA staff testified on these issues at several hearings, and provided numerous formal and informal briefings to majority and minority staff members on the Senate Finance Committee and the Senate Aging Committee.

3. *Defensive Medicine and Medical Malpractice*: As issues of malpractice reform arose throughout the health care reform debate, staff of the House Ways and Means Committee, the Senate Judiciary Committee, the House Judiciary Committee, and the Majority Leader's Office used OTA's reports on the issues and were

informally briefed on the implications of the studies. OTA also testified before the Senate Finance Committee on the issue as part of the Health Care Reform hearings.

4. *Understanding the Economic Impacts of Health Care Reform*: The OTA documents from this project were widely circulated among health policymakers and analysts throughout the legislative and executive branches. Although no concrete legislative action could be traced to the report, several examples of important policy discussions relying on the analysis in this report were reported to OTA. Senior OTA staff provided several high level staff and member briefings on the report. These members wished to understand the OTA findings before registering their votes in committee on health reform legislation.
5. Organizations, agencies and individual analysts responsible for producing economic projections for health care reform became noticeably more likely to qualify the certainty of their estimates after release of the OTA report, Understanding Estimates of National Health Expenditures Under Health Reform. This effect may well have been due to the central message of the OTA report, which emphasized the inherent uncertainty of these economic modeling exercises.
6. *The Continuing Challenge of Tuberculosis*: On August 28-30, 1994 the Centers for Disease Control and Prevention (CDC) and the National Institutes of Health (NIH) sponsored an invited conference for Federal and other experts on "Improving TB Treatment and Control: An Agenda for Behavioral, Social, and Health Services Research." The purpose of the conference was to set priorities for such research. OTA's report documented the paucity of good research on behavioral and social factors that contribute to the spread of TB or interfere with its treatment. Experts at CDC have informally credited OTA's report with raising this concern to high enough levels within the Department of Health and Humans Services (HHS) and in the broader policy community to make such a conference a reality.
7. Among the policy options considered in OTA's report on tuberculosis was a proposal to establish several "centers of excellence" for TB treatment and research. In the year since OTA's report was released, the Federal funds have been used to establish three such centers (through the New Jersey School of Medicine and Dentistry, at New York City's Harlem Hospital, and at San Francisco General Hospital).
8. The OTA review of the Department of Veterans' Affairs (VA) Persian Gulf Veterans' Health Registry was used to guide their revision of the registry's data collection instruments. The report also caused both the House and Senate Veterans' Affairs Committees to schedule hearings on the Registry and was used in both cases to develop questions for VA representatives.

11.5 Changes in Prior Plans for FY 1994 for the Health, Education, and the Environment Division

During Fiscal Year 1994, the Health, Education, and the Environment Division essentially accomplished its goals, with approved modifications and additions to meet the changing needs of Congress. These changes reflect the inherent uncertainty of research and the attendant need to be able to make adjustments.

11.6 FY 1995 and FY 1996 Priorities for the Health, Education, and the Environment Division

A Division's work is determined by the expressed needs of congressional committees, so we cannot safely predict an agenda, but an illustrative list of subjects that are representative of the kinds of new assessments that we may be asked to undertake can be prepared. Such an exercise, using a wide variety of information sources, helps sharpen the discussions between OTA staff and congressional committees. It also reflects one of the charges Congress assigned to OTA: foresight about emerging technology. Of course each Division can undertake only a few new assessments each year, so this list should be viewed only as representative of potential subjects for the

ANSWERS TO POST-HEARING QUESTIONS

Responses by Jon M. Peha, Professor, Departments of Engineering and Public Policy and Electrical and Computer Engineering, Carnegie Mellon University

Questions submitted by Representative Eddie Bernice Johnson

Q1. Do you feel it would be beneficial for Congress to have its own internal scientific advisors such as the Office of Technology Assessment Congressional Board? If so, how can we make sure the advice structure would be nonpartisan?

A1. Yes, Congress needs internal advisors with significant expertise in science and technology, where internal means in an organization dedicated to serving Congress as CRS, GAO, and CBO do today. One way to insure that the program remains nonpartisan is to establish a Technical Assessment Board or Congressional Board for oversight. This bipartisan bicameral Board should contain an equal number of members from the majority and minority party. All important decisions should require a majority vote, which means there must be support from both parties. Moreover, the Chairman's power must be limited so the views held by the majority will prevail.

The Board would be responsible for determining which studies are undertaken, and for agreeing upon their scope, cost, and duration with professional staff. The Board must insure that the studies produced are of interest to both majority and minority parties. It will help if they systematically give preference to studies that have been requested by many members from both parties, as might be quantified by the number of Republicans signing a letter of support times the number of Democrats signing a letter of support.

The Board must also approve major the selection of a Director. They should select a Director that has outstanding credentials as a scientist or engineer, and experience producing or overseeing balanced nonpartisan analyses of complex policy issues related to science or technology. Some experience with Congress is also important, but extensive service advancing one party over the other is probably a liability rather than an asset. A highly partisan choice is unlikely to gain support from a majority of the bipartisan Board.

Other safeguards against partisanship must be embedded in the organization and its procedures. Studies should not be designed to produce legislative recommendations; they should frame issues, and analyze options. Clearly that analysis must be rigorous and nonpartisan. It helps to conduct outside reviews of each study from a diverse set of reviewers, and to take all the reviewers' constructive criticism seriously. In many cases, outside review is required at more than one stage of the study. This review process goes far beyond the typical fact-checking that would be done today in GAO or CBO. In addition, a culture of nonpartisan professionalism must permeate the organization, and be sustained through hiring and promotion criteria that reward solid balanced analysis rather than convenient answers. History shows that this can be achieved under appropriate leadership from a highly qualified Director.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Albert H. Teich, Director of Science and Policy Programs, American Association for the Advancement of Science

Questions submitted by Representative Eddie Bernice Johnson

Q1. Do you feel it would be beneficial for Congress to have its own internal scientific advisors such as the Office of Technology Assessment Congressional Board? If so, how can we make sure the advice structure would be nonpartisan?

A1. As I indicated in my testimony, I believe that Congress needs timely analysis and synthesis of scientific and technical information as a foundation for its decision-making. It is my view that an organizational mechanism that is directly responsive to congressional requests would serve this need most effectively. Experience suggests that establishing an internal body (i.e., a congressional service agency whose staff is employed by Congress) is the best way to guarantee responsiveness. The staff should be high quality and include experts in both science and policy. Staff members need not—in fact it cannot—be expert in all science and technology policy areas likely to come before Congress, but they should have the ability to draw upon external expertise as necessary. That expertise might reside in other congressional service agencies (e.g., CRS or GAO) or it might be found in the National Academies, scientific associations, think tanks, or the broader scientific and policy community.

Assuring that this structure would be nonpartisan is more complicated. I don't have a ready answer, but I would suggest that Members examine carefully the existing sources of nonpartisan information and advice for Congress—CRS, GAO, CBO, and the National Academies—and identify and analyze the traits that best facilitate their insulation from partisanship. These shared traits likely include some combination of an independent, bipartisan oversight mechanism and the ability to protect their staffs from undue political pressures. It may also be useful for the advice structure to have its analytical processes (e.g., workshops and meetings) rendered in a public rather than in a private setting, except in instances where secrecy is needed to protect national security.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Peter D. Blair, Executive Director, Division on Engineering and Physical Sciences, National Academy of Sciences

Questions submitted by Representative Eddie Bernice Johnson

Q1. Do you feel it would be beneficial for Congress to have its own internal scientific advisors such as the Office of Technology Assessment Congressional Board? If so, how can we make sure the advice structure would be nonpartisan?

A1. Reactivating the former Office of Technology Assessment's Technology Assessment Board (TAB) is certainly one expedient option for filling the gap in advice the Congress is currently receiving, as essentially all witnesses noted in the hearing (since it would only require appropriations and not authorizing legislation). There are other options as well but the construction of mechanisms for nonpartisan operation would be essential to the credibility of the advice it offers and to ensuring both such an organization's usefulness and direct accountability to the Congress.

As a historical reference, the TAB structure as originally incorporated into the OTA authorizing legislation was perhaps the most important organizational mechanism for ensuring a nonpartisan operation. Construction of something analogous in any new entity would probably be very challenging to maintain, especially if the organization were located outside the Congress. I pointed out in my testimony that if an OTA-like institution existed today, it would likely have a number of important differences from the OTA that existed between 1972 and 1995, but the mechanisms for ensuring independent and nonpartisan analysis are not really among those differences, since those mechanisms were painstakingly constructed to achieve both bicameral and bipartisan balance in the agency's oversight and governance.

A TAB-like body would be essential to any such organization in ensuring both relevance to the Congressional agenda and balance in its governance in several dimensions. At the former OTA, TAB's composition was unique among the legislative support agencies—a twelve-member governing board with six members of the Senate and six of the House, divided exactly equally between the political parties. TAB's principal responsibilities were to appoint the Director, to authorize the initiation of assessments requested by Congressional Committees, to approve the budget authority associated with each of those assessments, and finally to authorize delivery of assessment reports to requesting committees and the public by certifying that OTA has carried out its assessment process faithfully, i.e., that OTA has considered all the relevant stakeholder interests and issues and undergone and responded to extensive external review. For your reference, I recap the strengths and weaknesses of these features in more detail in the 1994 paper I prepared on the subject, *Technology Assessment: Current Trends and the Myth of a Formula* (available at *http://www.wws.princeton.edu/ota/*) as well as in the more recent report I included for the hearing record.

As a point of reference, in the early days of OTA many thought that TAB would not work. It was predicted by some that TAB would either become a disinterested body or a dysfunctional one due to partisan disagreements. But as the agency matured organizationally, neither of these predictions happened. Board members were appointed by the leadership in both the House and the Senate and included very senior members of Congress from both political parties, some of whom are still in Congress today. The board met approximately every six weeks when Congress was in session with a strong turnout and with few disagreements reflecting party or ideological lines.

One historical anecdote illustrates the effective functioning of the TAB at OTA. A TAB member voted in the board meeting to authorize the release of a somewhat controversial study on the technological future of textile industry, acknowledging that the assessment process had been completed effectively. The next day, however, he issued a press release politically criticizing some of the alternative policy options identified in the report's conclusions. Some felt that this was inconsistent and perhaps even hypocritical, but actually he had honored both his responsibilities. First he honored his responsibility on the board by not letting the implications for his constituents of some the identified alternative policy options affect his position on the overall perspective of the report. At the same time and in a separate venue, he accommodated the political concerns of his constituents by disagreeing with those options that were not in their interests.

This anecdote also underscores a fundamental point I was trying to make in my testimony. There are many organizations that can provide important input to Congressional deliberations and at least a few, such as the National Academies, that

can offer highly authoritative, independent and objective consensus findings and recommendations from a widely recognized group of experts on technical issues. However, there are essentially no organizations well-equipped currently to inform the Congressional debate on complex science and technology issues with perspectives that may go beyond science and technology to include the broader implications of alternative actions or options related to the science and technology issues being considered and, especially, a comprehensive evaluation of such perspectives with mechanisms in place to ensure independence and balance of that evaluation.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Catherine T. Hunt, President-Elect, American Chemical Society; Leader for Technology Partnerships, Rohm and Haas Company

Questions submitted by Representative Eddie Bernice Johnson

Q1. Do you feel it would be beneficial for Congress to have its own internal scientific advisors such as the Office of Technology Assessment Congressional Board? If so, how can we make sure the advice structure would be nonpartisan?

A1. I do feel strongly that it would be very beneficial for Congress to have its own internal scientific advisors. Currently, Congress has two internal sources for obtaining input on scientific and technical issues—the Congressional Research Service, which provides excellent background and summary documents, and the General Accounting Office, which performs economic analyses. Congress also can utilize the National Academies to secure in-depth, long-term analyses of scientific and technical issues. Each has its strengths, yet something is missing: an internal agency that provides a data- and information-based policy analysis to meet Congress' specific decision-making needs.

Since the Office of Technology Assessment was eliminated in 1995, Congress has functioned without an impartial internal unit that can frame complex issues, provide comprehensive and balanced insights and analysis, and set out policy options on science and engineering issues. These issues require more than facts and short reports, they need adequate scoping, integration and non-partisan analysis of large-scale issues involving science and technology. Congress clearly should continue to utilize outside experts in this regard, including the National Academies, but they cannot meet all of Congress' frequent and extensive needs.

The need for timely, comprehensive technical analyses is clearly demonstrated by the success that Fellow programs, such as the one coordinated by AAAS, have had on the Hill. Individual Members of Congress have certainly recognized the need for scientific input in making policy decisions, but unfortunately, with only 35 or so Fellows available each year, these programs cannot fill all the needs of all the Members. A new congressional agency would ensure that such information would be available to all.

The second part to your question, about ensuring that the advice is nonpartisan, is a difficult one for me to answer. My experience is as a scientist, not a politician, so I will defer to the experts in Congress on the details of this question. However, I can hopefully add some insight by highlighting the main tool my field uses to maintain integrity: peer review. It is a central tenet of practicing scientists. Journal articles and reports are often sent out for both internal and external reviews by experts. This enables us to find errors, correct misinterpretations, and generally improve our work. Reports written by a new congressional unit should be subject to a similar process. Employees would have to rely significantly on outside experts and to refine their analyses. If the data and the analyses are correct, they should hold up to external scrutiny.

Appendix 2:

Additional Material for the Record

IEEE★USA

STATEMENT

By

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS-UNITED STATES OF AMERICA (IEEE-USA)

To The

UNITED STATES HOUSE OF REPRESENTATIVES COMMITTEE ON SCIENCE

For The

OVERSIGHT HEARING ON "SCIENTIFIC AND TECHNICAL ADVICE FOR CONGRESS"

25 July 2006

IEEE-USA commends the House Science Committee for its foresight in holding a hearing on Scientific and Technical Advice for the U.S. Congress to examine how Congress receives advice and assessment about science, engineering and technology and whether and how the mechanisms for providing this need to be improved. There is consensus that a gap in of science and technology (S&T) advice and assessment that Congress receives from various interest groups. There is a need for Congress and decision-makers to receive up to date, timely unbiased and sound advice and assessment on legislation involving the nation's science and technology policy.

The rapid pace of technological change, coupled with technology diffusion and globalization trends, are raising profound issues for the nation's scientific preeminence and technological competitiveness. For the United States to remain economically strong and militarily superior, our science and technology policy must be based on unbiased, balanced, and impartial advice, backed up by sound technical analysis.

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Since the defunding of the Office of Technology Assessment (OTA) in 1996, three trends have reinforced the need for Congress to have a trusted resource of credible and unbiased technical analysis accomplished in a timely and efficient manner:

First, the rapid pace of technological change is exponentially expanding the number of technology-related policy issues that Congress must wrestle with. Technology impacts nearly every facet of our lives. Consider our growing dependence on cell phones and *Blackberrys* to efficiently conduct business and increase productivity. A few short years ago it was unthinkable to predict that we would be using the Global Positioning System in our cars to navigate to our destinations. Today we are using radio frequency devices to monitor the movement of products and people. This explosive growth in science and technology, fueled by the Internet and information technology, has also produced a communications revolution that has resulted in a flood of information inundating Congress.

Also, as technology has become more complex and pervasive, there is an increasing multitude of interest groups with separate agendas interpreting and communicating data to advance their respective interests. The end results are separate and sometimes totally different conclusions rendered in good faith leading to divergent and conflicting scientific and technical policies.

Technology-driven globalization trends also pose significant challenges that Congress must be prepared to understand and respond to if the United States is to remain technologically competitive and sustain our national standard of living. Other foreign competitors, such as the European Union, Japan, China and India, are moving rapidly to overtake the U.S. in many technology areas. Russia is posed to dominate the European energy markets and eventually expand globally. Congressional legislative decisions made today will impact our economic competitiveness in the global economy, our national security and our society in the decades ahead.

Science and technology policies, and their implications for the future of the American society, are complex issues. Inevitably policy choices involve painful prioritizations and trade-offs. For example, what are the ideal priorities for the nation in investing in future energy policies such as alternate fuels, nuclear power, efficient vehicles, public mass transportation and a viable national electrical power grid? Another example, is or is there not global warming, and what should or can America do about it? These are difficult issues requiring technical analysis by experts. Furthermore, the impact of the policy choices and the return on investment are often not immediately obvious until way into the future. These and other issues require investing in a basic and applied research necessary to create the technology base to resolve these complicated critical issues. In order for the United States to remain a world leader in advanced technology in the 21st century and beyond, it is critical that Congress have access to objective, timely and nonpartisan sources of science, engineering and technology-related assessment pertinent to the complex legislative issues before them.

In the recent past, legislation has been introduced in Congress to improve Congress' access to science advice and technology assessment with the support of several engineering professional organizations including the IEEE-USA. In June 2004, Congressman Rush Holt introduced H.R. 4670 to build upon the pilot project with GAO to establish a Center for Scientific and Technical Assessment. The Center would be dedicated to providing Congress with information, analysis, and advice on issues related to science and technology. We strongly supported that legislation because it would create a bipartisan organization to provide the timely and needed technical analysis and advice to Congress. We will support it again, if and when it is reintroduced.

A bill introduced in the Senate, S. 1716, in 2001 was intended to create a Science and Technology Assessment Service to provide on-going independent science and technology advice within the legislative branch of the government.

IEEE-USA applauds these efforts and their champions and strongly urges Congress to introduce and adopt similar legislation in the near future.

There is much that can and should be done to strengthen Congress' access to technology assessments in its policy process. The IEEE-USA has members who are experts in the various disciplines such as electronics, nanotechnology, electrical engineering, computer science, information technology, cyber security, medical technology, energy, transportation, and communication technology. We are non-partisan scientists and engineers who understand the implications of technology and policy choices. We stand ready to assist Congress and its members.

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Order Code RS21586
Updated May 20, 2005

CRS Report for Congress

Received through the CRS Web

Technology Assessment in Congress: History and Legislative Options

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Summary

Congress created the Office of Technology Assessment (OTA) in 1972, P.L. 92-484, and terminated its funding in 1995. The pros and cons of reviving OTA or re-creating a similar body have been examined. Since 2002, at congressional direction, the Government Accountability Office (GAO, formerly the General Accounting Office) conducted two pilot technology assessments and is completing two others. Legislation was proposed during the 108th Congress to restore OTA's funding (H.R. 125); create an entity to conduct assessments for Congress (H.R. 6 as passed in the Senate); conduct technology assessments in GAO (report language on H.R. 2657, H.R. 4755, and S. 2666); and create a technology assessment capability in GAO (S. 2556) or under its direction (H.R. 4670). Policy issues under discussion include the need for assessments, funding, the utility of GAO's technology assessment-related reports, and options for institutional arrangements. This report will be updated as needed.

Office of Technology Assessment. Congress established OTA in 1972 with passage of P.L. 92-484. It was mandated to assess the consequences of applying technology by preparing comprehensive reports that discussed the pros and cons of policy options about an issue. The law effectively augmented existing congressional resources by creating a support agency dedicated to providing Congress with objective and authoritative analysis of complex scientific and technical issues to aid in policymaking. It was intended to facilitate congressional access to expertise and permit legislators to consider objectively information presented by the executive branch, interest groups, and other stakeholders to controversial policy questions. From 1973 until 1995, OTA conducted technology assessments, requested by committee chairmen for themselves, ranking minority members, or a majority of the committee, by the Technology Assessment Board (a body which was composed of equal numbers of House and Senate members and of members from both parties), or by the OTA Director in consultation with the Board. OTA had authority to hire staff and to contract for personnel and studies. Peak funding in the early 1990s totaled over $20 million annually, with about 140 hired staff plus additional contractors. OTA was effectively eliminated when Congress did not appropriate funds for FY1996 for its continued operation and appropriated funds to close

down the office. Its archived reports are available via the Internet at [http://www.wws.princeton.edu/~ota/].

Several reasons were given for terminating OTA's funding and numerous studies have been written about the rise and fall of the agency. Critics of OTA cited such factors as difficulty in completing reports in time to meet congressional schedules, lack of utility to congressional decisionmaking, alleged bias toward "liberal" solutions, or partisan politics.[1] Some say that Congress can turn to and fund studies by The National Academies, composed of the National Academy of Sciences (NAS), the National Academy of Engineering, the Institute of Medicine, and the National Research Council (NRC), or utilize the services of GAO and the Congressional Research Service (CRS) for information and analysis on science and technology issues.[2] Others disagree and cite the utility of OTA studies to decisionmaking and the need for Congress to maintain its own support agency devoted to assessing technology.[3] Some former OTA staff members and science policy analysts[4] have called for resumption of funding for OTA or creation of a legislative organization to perform OTA-like functions or to contract with outside groups to perform such functions. Some Members of Congress and others have said that if the OTA were still operating it might have provided Congress with information required to make important program and policy decisions relating to technological issues.[5]

Legislation to Fund OTA. In the 107th Congress, Representative Rush Holt introduced H.R. 2148, the OTA Re-establishment Act. It would have authorized funding OTA at $20 million annually for FY2002 to FY2007. The bill ultimately had 87 co-sponsors, but no further action was taken. Similar legislation, H.R. 125, was introduced

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[1] See "OTA Reconsidered, Letter by Robert S. Walker," *Issues in Science and Technology,* Spring 2001; Bruce Bimber, *The Politics of Expertise in Congress, The Rise and Fall of the Office of Technology Assessment,* State University of New York Press, 1996, 128 p.; Bruce Bimber and David H. Guston, "Technology Assessment; The End of OTA," in *Technological Forecasting and Social Change, Special Issue,* Nos. 2 and 3, February/March 1997, whole issue; *Science and Technology Advice for Congress,* M. Granger Morgan and Jon Peha, eds., Washington, Resources for the Future, 2003, 236 p.

[2] See M. Davis, "A Reinvented Office of Technology Assessment May Not Suit Congressional Information Requirements...,"*Washington Fax,* June 18, 2001.

[3] See Daryl E. Chubin, "Filling the Policy Vacuum Created by OTA's Demise," *Issues in Science and Technology,* Winter 2000, 31-32; "OTA Reconsidered, Letter From John H. Gibbons, Letter From Roger Herdman" *Issues in Science and Technology,* Spring 2001; John A. Alic, "OTA Assessments Were Tailored for Congress," *Science,* Feb. 1, 2002; Rep. Amo Houghton, "In Memoriam: The Office of Technology Assessment, 1972-95," Extension of Remarks, *Congressional Record,* Sept. 28, 1995, E1868-E1870.

[4] M. Granger Morgan, Amo Houghton, and John H. Gibbons, "Improving Science and Technology Advice for Congress," *Science,* Sept. 14, 2001; David H. Guston, "Prospects of a Revived OTA for Congress," *Science,* July 13, 2001; and D. Malakoff, "Memo to Congress: Get Better Advice," *Science,* June 23, 2001.

[5] For example, "Need for Reestablishing the Office of Technology Assessment," Extensions of Remarks of Hon. Rush D. Holt, *Congressional Record,* Dec. 5, 2001, p. E2212 and Ellis Mottur, *Technology Assessment in the War on Terrorism and Homeland Security: the Role of OTA,* Report Prepared at the Request of Hon. Ernest F. Hollings, Chairman, Senate Committee on Commerce, Science, and Transportation , 107th Cong. 2nd Sess., S. Prt. 107-61, Apr. 2002.

in the 108th Congress. It proposed to rename the Technology Assessment Act of 1972 as the Office of Technology Assessment Reestablishment Act of 2003 and to authorize OTA appropriations at $20 million annually for FY2004 to FY2009. The bill was referred to the House Science Committee.

Representative Holt sought, in 2002, to introduce an amendment to H.R. 5121, the Legislative Branch Appropriations Act FY2003, to provide $4 million to fund OTA for FY2003. He made a similar attempt in 2003 to amend the FY2004 Legislative Branch Appropriations bill, H.R. 2657, to fund OTA at $7 million. Both times the Rules Committee ruled the amendment not in order.[6]

Legislation to Create An OTA-like Organization for Congress. Since 2001, proposals have been made to create an OTA-like office in the legislative branch to provide technology assessment-related support.

Science and Technology Assessment Service. Section 153 of S. 1716, "The Global Climate Change Act," introduced in 2001 by Senator John F. Kerry, would have created a Science and Technology Assessment Service to provide ongoing independent science and technology advice "... within ... the legislative branch." Assessments would have been conducted using experts selected in consultation with the National Research Council (NRC), the policy research arm of The National Academies.[7]

OTA had focused on providing information about technology's *impacts*, notably "early indications of the probable beneficial and adverse impacts of the applications of technology" and other information. In contrast, the proposed Service would have developed information on "the uses and applications of technology to address current national science and technology policy issues." It would have incorporated many features of OTA, including a bipartisan and bicameral congressional board to govern activities; a Director to carry out policies and manage activities; and a process to select studies using Committee chairmen, the Board, or the Director. The organizations would have differed because the Assessment Service would have used NRC to select experts to conduct assessments, a provision that was not in the OTA law; and be smaller than OTA, lacking OTA's Deputy Director and Technology Assessment Advisory Council, the latter which was composed of private experts, the Comptroller General, and the CRS Director, to advise the Board on OTA operations and on assessment reports. It would have had authority to contract and use personnel, but would have had less specific authority than OTA to purchase and hold property, detail personnel from other agencies, or obtain information from them. It would not have had OTA's authority to seek assistance from CRS and the National Science Foundation, nor to distribute reports.

Language to create an Assessment Service was included as Title XVI of S. 1766, the Energy Policy Act of 2002, introduced in December 2001. S. 1766 was incorporated as substitute amendment (SA) 2917 to S. 517, the Energy Security Policy bill. The language relating to the Assessment Service in S. 517 was identical to that in S. 1716 and S. 1766.

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[6] Statement of Rep. Holt, "Providing for Consideration of H.R. 5121, Legislative Branch Appropriations Act, 2003," on the Floor of the House, July 18, 2002, p. H4880. Statement of Rep. Holt, *Congressional Record,* July 9, 2003, pp. H6427-H6428.

[7] Remarks Upon Introduction of S. 1716, *Congressional Record,* Nov. 15, 2001, p. S11957.

On April 10, 2002, during floor consideration, Senator John McCain submitted S.Amdt. 3089 to delete language to create the Assessment Service from S.Amdt. 2917. However, on April 25, 2002, Senator McCain said on the floor of the Senate[8] that he would withdraw his amendment and urged the Chairman of the Senate Commerce, Science, and Transportation Committee to hold hearings on the proposal in order to assess "the needs and benefits" of such a Service to Congress. On April 25, 2002, the Senate incorporated S. 517, as amended, into H.R. 4 as passed in the House, and passed the bill. A conference was held; no final action occurred. During the first session of the 108th Congress, the Senate could not reach agreement on energy legislation (S. 14) and acted on a substitute amendment to the energy bill passed in the House (H.R. 6). The substitute was the energy bill (H.R. 4, 107th Congress) it had passed in 2002, which contained Title XVI to create the Science and Technology Assessment Service. Thus, H.R. 4 (2002), was introduced as SA1537 to H.R. 6, as passed in the House. The Senate agreed to SA1537, and H.R. 6 incorporating it was passed. The Assessment Service provision was not in the conference report on H.R. 6, H.Rept. 108-375, which the House agreed to. No further action occurred on this bill.

Center for Scientific and Technical Assessment. H.R. 4670 was introduced in June 2004, by Mr. Holt, with 15 bipartisan co-sponsors and referred to the House Science Committee. It proposed a Center that would consist of a Technical Assessment Board, with 12 Members of Congress, 6 from each party and each body; the Comptroller General; and as non-voting members, the CRS Director and the Center's Director. Operating the center would be a Director and Deputy Director empowered to act, with the permission of the Comptroller General, to hire staff and enter into contracts to perform assessments. The Director would have been authorized to establish an advisory panel for each assessment; the panels would not be subject to the Federal Advisory Committee Act (FACA; 5 U.S.C.App.). Different from the earlier OTA, any Member of Congress would have been able to make requests to the Board for assessments. Requests would have had priority as follows: "requests with bipartisan and bicameral support; requests with bipartisan support; requests from other members." Each assessment report would have been subject to rigorous external peer review before delivery to the Director, who would have sought release approval from the Board. Reports would have been released to the public. The bill would have authorized $30 million annually to the Comptroller General for the Center for the fiscal years 2005 to 2007. On July 12, 2004, Representative Holt offered H.Amdt. 667 to H.R. 4755, the House's FY2005 Legislative Branch Appropriations bill, to add $30 million to GAO's account for a Center for Scientific and Technical Assessment; the House rejected the amendment.

Technology Assessment in GAO. For three years, appropriations language has directed GAO to conduct technology assessments on a pilot basis and legislation has been introduced to make the program permanent; there also were proposals to authorize an assessment office in GAO.

FY2002. H.Rept. 107-259, the conference report to accompany H.R. 2647, the Legislative Branch Appropriations Bill for FY2002, enacted as P.L. 107-68, directed that up to $500,000 of GAO's appropriation be obligated to conduct a technology assessment pilot project and that results be reported to the Senate by June 15, 2002. The provision

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[8] *Congressional Record,* Apr. 25, 2002, pp. S3407-S3408.

had originated in the Senate, sponsored by Senator Jeff Bingaman.[9] S. 1172 would have authorized $1 million for the study; it was amended by S.Amdt. 1026, and passed in the Senate. The provision seemed to focus on a study to be conducted by The National Academies and on a model that might lead to possible funding for a small OTA-like organization to conduct assessments largely by issuing contracts to non-profit groups. The enacted Legislative Branch Appropriations bill did not contain this language.

The conference report did not authorize an assessment topic, but three Senators requested GAO to assess technologies for U.S. border control together with a review of the technology assessment process. At the same time, six House Members wrote to GAO supporting the pilot technology assessment project. After consulting congressional staff, GAO agreed to assess biometric technologies. It used its regular audit processes and also its standing contract with The National Academies to convene two meetings which resulted in advice from 35 external experts on the use of biometric technologies and their implications on privacy and civil liberties. The resulting report was issued in November 2002 as *Technology Assessment: Using Biometrics for Border Security*, GAO-03-174.

FY2003. The FY2003 Senate legislative branch appropriations report noted the utility of GAO's work and said it provided $1 million for three studies in order to maintain an assessment capability in the legislative branch and to evaluate the GAO pilot process (S.Rept. 107-209, on S. 2720, pp. 49-50.) This language was not included in the Senate bill (S. 2720); the House bill (H.R. 5121) or the accompanying report; or in H.J.Res. 2, enacted as P.L. 108-7, which included Legislative Branch Appropriations for FY2003; or in the accompanying conference report. Although funds were not provided for a study, GAO conducted a technology assessment that was published as *Cybersecurity for Critical Infrastructure Protection,* May 2004, GAO-04-321, 214 pp.

FY2004. The House Appropriations Committee's report on Legislative Branch Appropriations for FY2004 directed GAO to "... allocate within existing resources funding that will permit three technology assessment studies that will be of relevance to the Congress's work in the upcoming fiscal year" (H.Rept. 108-186, on H.R. 2657, p. 25). The language was not in the House bill as passed. The Senate incorporated S. 1383 in H.R. 2657, and passed it, amended. The accompanying S.Rept. 108-88 recommended $1 million for two or three technology assessments in FY2004 and said that the Appropriations Committee expected GAO's technology assessment work to be undertaken only if it were consistent with GAO's mission (p. 44). According to the Conference Committee, GAO's two-year evaluation of the need for legislative technology assessment showed that "such a capability would enhance the ability of key congressional committees to address complex technical issues in a more timely and effective manner." The conferees directed GAO to report by December 15, 2003 to the House and Senate

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[9] Sen. Bingaman had proposed that CRS manage the pilot study because he said, CRS is "better suited to conduct and oversee this type of long-term research activity." He also expected "that oversight would be provided by the Senate Rules and House Administration Committees and through these Committees, the Joint Committee on the Library of Congress." He disagreed with suggestions that the GAO might be better suited to manage the pilot, but said that "it is better to start an initial pilot program ...rather than no pilot program at all." He envisioned "...a small legislative branch staff using outside non-profit groups to perform the in-depth research," rather than the larger OTA model with a staff of about 200 people and funding of about $20 million. ("Office of Technology Assessment," *Congressional Record,* July 20, 2001, pp. S8008-S8009.)

Committees on Appropriations "... the impact that assuming a technology assessment role would have on its current mission and resources" (H.Rept. 108-279). The bill became P.L. 108-83. GAO reported directly to the Appropriations Committees.

FY2005. GAO requested $545,000 in FY2005 appropriations for four new FTE positions and contract support to establish "a baseline technology assessment capability," allowing GAO to conduct one assessment per year. The House Appropriations Committee in H.Rept. 108-577, to accompany the Legislative Branch Appropriations Bill, FY2005, H.R. 4755, did not address funding, but encouraged GAO to "... retain its core competency to undertake additional technology assessment studies as might be directed by Congress" (p. 27). In spring 2004, consistent with prior congressional directive, GAO initiated two assessments, one on port security, and another, which was published in April 2005 as *Technology Assessment: Protecting Structures and Improving Communication During Wildland Fires,* GAO-05-380. Representative Holt offered H.Amdt. 667 to H.R. 4755, to add $30 million to GAO's account for a Center for S&T Assessment; the House rejected the amendment on July 12, 2004. S.Rept. 108-307, to accompany S. 2666, indicated that while the Senate Appropriations Committee supported GAO doing technology assessments, it did not intend to appropriate specific funding for this purpose and that GAO should conduct assessments that are supported by both House and Senate leadership and that address issues of national scope. GAO was instructed to consult with the committee regarding definitions and procedures to conduct technology assessment.

On June 22, 2004, Senator Bingaman, introduced S. 2556, co-sponsored by Senator Joseph Lieberman, to establish a technology assessment capability in GAO. The bill was referred to the Governmental Affairs Committee. It proposed to mandate the Comptroller General to initiate technology assessment studies himself or at the request of the House, Senate, or any committee; to establish procedures to govern the conduct of assessments; to have studies peer reviewed; to avoid duplication of effort with other entities; in consultation with The National Academies to establish a five-member technology assessment advisory panel; and to have contracting authority to conduct assessments. It would have authorized $2 million annually to GAO to conduct assessments.[10] No further action was taken. See also H.R. 4670 above.

Policy Issues. The following issues could be considered when evaluating alternative technology assessment proposals: (1) analysis of the need for more technology assessment information and advice; (2) evidence of political support for enhancing legislative capabilities for technology assessment; (3) with respect to augmenting GAO's "core capability" to conduct technology assessment, the availability of funds, the timing, and the utility of GAO's technology assessments for congressional decisionmaking, and the pros and cons of locating a large assessment center within GAO, including its impact on other GAO functions, including auditing and evaluation activities; and (4) the potential benefits and costs of establishing a more independent legislative technology assessment function, such as in a separate OTA-like support activity or organization.

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[10] *Congressional Record*, June 22, 2004, S7180-S7182. Sen. Bingaman also documented several reviews of GAO's pilot technology assessments. He added "... GAO requested additional legislative authorities so that the assessments could be part of their annual budget process."

Scientific Advice for Policy in the United States: Lessons from the National Academies and the former Congressional Office of Technology Assessment

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Presented to: Symposium on Quality Control and Assurance in Scientific Advice to Policy, Berlin-Brandenburg Academy of Science & Humanities, Working Group on "Scientific Advice to Policy in Democracy," Berlin, Germany, January 12, 2006.

ABSTRACT

In the United States the National Research Council (NRC), the "operating arm" of The National Academies, is a widely used source for science and technology policy advice by government agencies and the U.S. Congress. Operating under an 1863 charter issued by Congress for the independent and non-government National Academy of Sciences, the NRC today delivers around 250 reports to government annually, spanning a wide spectrum of important science and technology related issues. NRC reports are viewed widely as valuable and credible because of the institution's longstanding reputation for providing independent, objective, and nonpartisan advice with high standards of scientific and technical quality.

The NRC study process is tuned primarily to the needs of federal executive agencies but carries out on the order of 25 studies annually requested by the U.S. Congress as well. The former Congressional Office of Technology Assessment (OTA) was an analytical support agency created by Congress in 1972 but closed down in 1995. During its existence OTA produced on average 32 assessment reports annually (703 in all over the agency's 23 year existence and on average 51 reports per year in the last three years), primarily for the standing committees of the Congress, using a process that produced reports on science and technology policy issues and accompanying advice tuned specifically to Congressional needs.

This paper explores and compares the study processes of the NRC and the former OTA, drawing conclusions from the comparisons that relate, in particular, to the relative strengths and weaknesses for ensuring quality, independence, authority, and relevance in providing science and technology advice to government and, in particular, the legislative branch of government.

INTRODUCTION

The pace of science and technology advancement over the past half-century has delivered enormous benefits to societies throughout the world as well as sobering challenges associated with the role of technology in virtually every aspect of our lives. While reaping the benefits, all of society must also cope with the challenges.

Over two centuries ago as the American democracy took shape, the founding fathers of the fledgling republic worried that democracy could flourish only when the electorate and, in particular, the institutions of government serving it are well informed about the issues upon which they must decide. Today, and increasingly, as science and technology issues become more and more prevalent, prominent, complex, and of far reaching impact on society, a democratic government poorly informed about such issues carries greater and greater risk in making bad policy choices. Yet, it is also becoming increasingly more difficult for anyone, or even any one institution, to keep pace with the frontier of scientific knowledge and its impact on society. In addition, over the last quarter century, the information revolution has expanded the quantity of information accessible to government policy-makers, but more information has not proved to be necessarily better information. Indeed, a fundamental problem today is not the lack of information; rather, it is how to gauge validity and usefulness within the torrent of available information and advice.

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[1] The author is Executive Director of the Division on Engineering and Physical Sciences of the U.S. National Academies. He was formerly Assistant Director of the U.S. Congressional Office of Technology Assessment (OTA) and Director of OTA's Division on Industry, Commerce, and International Security. Conclusions in this paper are the author's and are not necessarily those of the National Academies. This paper is an expansion of Ahearne and Blair (2002) and includes descriptions drawn from Blair (1994 and 1997) and The National Academies (2005a). The author greatly appreciates the advice of a number of reviewers, including John Gibbons, Christopher Hill, Jim Turner, Michael Rodemeyer, Jonathan Epstein, and E. William Colglazier.

How then can government policy-makers acquire useful, relevant, informed, independent, authoritative and timely advice on the science and technology dimensions of the issues they face? This paper reviews the current and evolving role of the U.S. National Academies in providing advice to government as that role compares with other current sources of advice. For this conference, also considered more specifically are the mechanisms of quality control in the study process of the National Academies, again as it compares with other sources of advice, and in particular with that of the former Office of Technology Assessment (OTA)[2] and with special attention to the Congressional needs for science and technology advice. Also, for purposes of this paper, the characterizations of the Academy and OTA study processes are stylized in that they are described in the ideal and most common study situations, although in both cases there were considerable variations around the specific processes presented here.

THE ROLE OF THE NATIONAL ACADEMIES

In the U.S. among the most familiar sources of independent scientific and technical advice to the Federal Government is the collection of non-government organizations we refer to today as the National Academies, comprising the National Academy of Sciences (NAS), the National Academy of Engineering (NAE), the Institute of Medicine (IOM), and their collective "operating arm," the National Research Council (NRC).[3] In 1863 the U.S. Congress chartered the NAS as an independent non-profit corporation to "whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject of science or art." This charter was signed into law by President Abraham Lincoln during the height of the U.S. Civil War.

Today the NAS, NAE, and IOM are prestigious and highly selective honorary societies that each elect among the most respected scientists and engineers in the world as new members to their ranks annually. The Presidents of the NAS and NAE serve *ex officio* as the Chair and Vice-Chair, respectively, of the NRC. The NRC assembles committees of experts including many academy members to provide advice in the form of study reports to executive branch agencies of government, but the U.S. Congress also frequently mandates studies to be carried out by the NRC.[4] NRC studies span a wide spectrum of science and technology related issues, resulting in around 250 reports[5] annually, involving nearly 10,000 volunteers serving on study committees and in the review process as well as utilizing over a 1,000 professional staff to manage and facilitate the efforts of study committees.

NRC reports are viewed widely as being valuable and credible because of the institution's longstanding reputation for providing independent, objective, and nonpartisan advice with high standards of scientific and technical quality. The key strengths of the NRC in providing advice to the U.S. Government rest principally on the history of convening very high quality expertise for its study committees and on the reputation for maintaining important quality control features for independence and objectivity of reports prepared by those committees. In particular, over the years as the NRC study process evolved, many checks and balances have been incorporated to ensure quality and protect the integrity of reports thereby helping to maintain public confidence in them. In 1997 many of these checks and balances, supplemented with some additional features, were codified into federal law as NRC advice to the government became subject to a new provision of the *Federal Advisory Committee Act* (discussed later). In short, the NRC study process is widely accepted as a high standard for independent scientific advice to government.

Key Strengths of the NRC Study Process

These commonly cited principal strengths of the NRC study process include the following:

- **Credibility.** The NRC's institutional credibility is enabled in part by its association with the NAS, NAE, and IOM. In addition, the process by which the NRC conducts its work is designed to ensure the results are evidence-based and tightly reasoned as well as independent from outside influences and pres-

[2] The Congressional Office of Technology Assessment (OTA) was an independent analytical support agency of the U.S. Congress that was created in 1972 and operated from 1973–1995. The authorizing legislation for OTA still exists, but Congress no longer appropriates funds for its operation.

[3] More detailed descriptions can be found at The National Academies (2004) or Ahearne and Blair (2003).

[4] Academy studies carried out for Congress are usually executed under contract to executive departments and agencies as directed by Congress in authorizing or appropriations legislation.

[5] See The National Academy Press (2002), The National Academies (2005c), or the National Academy of Sciences (2005).

sures from various interest groups including government agencies and congressional interests. The Academies also conduct several studies each year using their own limited endowment resources rather than those of external sponsors. These self-initiated studies often focus on topics that the Academies leadership believes to be important but that the government may not be willing or able to sponsor on a schedule timely enough to be useful. One such example was the 2002 study, *Making the Nation Safer: The Role of Science and Technology in Countering Terrorism,* which followed the terrorist events of September 11, 2001 in the U.S. Another is the recent report, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future,* which puts forward recommendations for a comprehensive and coordinated federal effort to bolster U.S. competitiveness and preeminence in science and technology.

- **Convening Power.** The NRC seeks to invite the "best and the brightest" to participate in its studies and those invitations are generally accepted. Studies are carried out by groups of volunteers who are identified not only as broadly considered among the best experts on the issues to be studied, but also are determined through a well documented process to be free of conflicts of interest, and represent a carefully balanced set of perspectives on those issues. It is widely perceived as a prestigious honor to serve on an NRC committee and, because of the breadth of membership in the academies and the links of the organization to the scientific and technical communities worldwide, the NRC is well equipped to identify leading experts to serve on study committees.
- **Study Process and Products.** A highly structured process guiding NRC studies has evolved steadily over the years, but has always been and continues to be designed to maintain balance and objectivity throughout a committee's work and to produce reports considered to be both unbiased and authoritative. A key quality control feature in the process is independent peer review. After consensus is achieved by a study committee and a draft report is prepared, the NRC process requires the committee to address all of the comments from a carefully selected collection of reviewers, whose identities are not revealed to the committee until the study is publicly released. The review process is managed by a monitor appointed by the Report Review Committee, which is an independent committee of the National Academies (discussed more later).

Overview of the NRC Study Process

The NRC study process can be defined as a sequence of five major stages: (1) study definition, (2) committee selection, (3) committee activity (meetings, information gathering, deliberations, and report preparation), (4) report review, delivery and public release, and (5) final publication and dissemination.[6]

STAGE 1. Study Definition

Management and staff of the National Academies along with members of oversight committees (known as boards) appointed by the chair of the NRC are responsible for oversight of specific segments of the overall NRC study portfolio. There are around 50 such boards in the NRC organization, such as the Board on Energy and Environmental Systems or the Board on Life Sciences. These groups interact with sponsors to define the specific set of questions to be addressed by a prospective study resulting in a formal "statement of task" (SOT) as well as the anticipated duration and cost of the proposed study. The SOT defines and bounds the scope of a prospective study and serves as the basis for determining the expertise and the balance of perspectives needed on the committee that will be recruited to carry out the study. In addition, the SOT serves as a fundamental point of departure for subsequent independent peer review of the draft report prepared by the study committee.

The SOT, and the accompanying detailed plan for executing the committee's work, and the project budget are all reviewed and approved or revised by the Executive Committee of the NRC Governing Board (GBEC) comprised of elected and appointed officials of the NAS, NAE, and IOM. This review can result in changes to the proposed SOT and work plan and, on occasion, results in turning down proposed studies that the institution, after consideration, believes are inappropriately framed or not within the charter of the National Academies. Following GBEC approval and

[6] Much of this description is adapted from The National Academies (2005a). More detailed descriptions of the NRC study process include National Research Council (1998, 2000 and 2005b).

execution of a contract (or grant)[7] specifically for that study with the agency sponsor, work begins on the study itself.

STAGE 2. Committee Selection

Members of NRC study committees are formally appointed by the Chair of the NRC. Committee members serve without compensation except for reimbursement of expenses associated with attending meetings. The selection of appropriate committee members for an NRC study, both the individuals selected and the composition of the group as a whole, is key to the credibility and authority often associated with NRC reports. A great deal of research by NRC staff and management takes place prior to appointment of a committee in order to identify the strongest possible candidates.

NRC committee members serve as individual experts, not as representatives of organizations or interest groups. They are initially appointed provisionally and a committee is not finally approved until a discussion of the committee's composition and balance is held at the first meeting where any issues regarding potential conflicts of interest or balance of perspectives represented on the committee that are raised in that discussion or by the public[8] are investigated and addressed. This discussion and follow up consideration by NRC management sometimes results in changes to the committee membership. The goal of this process of analyzing the prospective committee's composition and balance is to ensure that committees meet the following criteria:

- **An appropriate range of expertise for the task.** Committees are designed to include experts with the specific expertise and experience needed to address the study's SOT. One of the strengths of the National Academies is the tradition of bringing together recognized experts from diverse disciplines and backgrounds who might not otherwise collaborate. These diverse groups are encouraged to conceive new ways of thinking about problems.
- **A balance of perspectives.** While ensuring that the right expertise is represented on the committee is essential, it is not alone sufficient for an effective committee on most NRC studies. It is also important to evaluate the overall composition of the committee in terms of a diversity and balance of experiences and perspectives. The goal is to ensure that the most important points of view, in the National Academies' judgment, are reasonably balanced so that the committee can carry out its charge objectively and credibly.
- **Screened for conflicts of interest.** All provisional committee members are screened in writing and in a confidential group discussion regarding possible conflicts of interest. For this purpose, a "conflict of interest" is actually quite narrowly defined as any financial or other interest which conflicts with the service of the individual on the committee because it could significantly impair the individual's objectivity or could create an unfair competitive advantage for any person or organization. In particular, the term "conflict of interest" in the NRC study context means something more than individual bias. There must be an interest, ordinarily financial, that could be directly affected by the work of the committee. Except in very rare situations where the National Academies determines that a conflict of interest is unavoidable and promptly and publicly discloses the conflict of interest, no individual can be appointed to serve (or continue to serve) on a committee of the institution used in the development of reports if the individual has a conflict of interest that is relevant to the charge of the study committee. Many potential conflicts of interest, as opposed to real conflicts as defined above, are balanced by different viewpoints represented by other members of the provisional committee.
- **Other considerations.** Membership in the "three academies" (NAS, NAE, IOM) and previous involvement in National Academies studies are taken into account in committee selection. The inclusion of women, ethnic minorities, and young professionals are important as well, and additional factors such as geographic diversity and a diversity of institutional affiliations are also considered.

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[7] Costs for NRC studies sponsored by government agencies are covered and accounted for via specific contracts for each study individually. For a variety of reasons (discussed later in this paper) the NRC has been reluctant to operate under a more centralized funding mechanism with the government, such as an annual appropriation from Congress.

[8] Provisional committee membership is posted on the National Academies Internet web site for a period of 20 days prior to the first meeting of the committee and the public is invited to provide comments on the committee composition and balance of perspectives.

The specific steps in the committee selection and approval process are as follows: (1) academy staff solicit an extensive number of suggestions for potential committee members from a wide range of sources; (2) a recommended a slate of nominees is put forward for approval through several levels within the NRC management, with the provisional slate ultimately approved by the NRC Chair; (3) the provisional committee member list is posted for public comment on the National Academies Internet site and members are asked to complete background information and conflict of interest disclosure forms, which are subsequently reviewed by academy management and staff.[9] Then, (4) a discussion of the committee's overall balance and potential conflicts of interest is held at the first committee meeting; (5) any conflicts of interest or issues of committee balance and expertise are investigated; and, if necessary, (6) changes to the committee are proposed and finalized before the committee is formally approved. Finally, (7) committee members continue to be screened for conflicts of interest throughout the duration of the committee's work.

STAGE 3. Committee Activity

Study committees typically gather information through: (1) meetings that are open to the public and that are announced in advance through the National Academies Internet site; (2) the submission of information by outside parties; (3) reviews of the scientific literature (and other sources as relevant), and (4) the investigations of the committee members and staff. In all cases, efforts are made to solicit input from individuals who have been directly involved in, or who have special knowledge of, the problem under consideration. In accordance with federal law and with few exceptions, information-gathering meetings of the committee are open to the public.

Any written materials provided to the committee by individuals who are not officials, agents, or employees of the National Academies are maintained in a Public Access File that is available to the public for examination. The committee deliberates in meetings closed to the public in order to develop draft findings and recommendations free from outside influences.[10] The public is provided with brief summaries of these meetings that include the list of committee members present (posted on the Academy's Internet site), but all analyses carried out by the committee and drafts of the report remain confidential. Occasionally academy studies employ contractors to provide supplemental analyses to support the staff and committee's work although this is typically not a major component of most studies.

NRC committees assume authorship of the study report, although in practice who actually drafts the report varies considerably. For example in many cases the appointed committee members draft much of the text at all stages of a report; in other cases committee members critique drafts prepared by staff; and often collaborative combinations of committee and staff authorship produce successive drafts.

STAGE 4. Report Review

As a final check on the quality and objectivity of an NRC study, all reports undergo a rigorous, independent external review by experts whose comments are provided anonymously to committee members. The NRC recruits independent experts with a range of views and perspectives to review and comment on the draft committee report.

The Academy's report review process is structured to ensure that a report addresses its approved study charge and does not exceed it;[11] that the findings are supported by the scientific evidence and that concluding arguments are presented clearly; that the exposition and organization of the report are effective; and that the report is impartial and objective. Each committee is required to respond to, but need not (necessarily) agree with reviewer comments in a detailed "response to review" document that is examined by one or two independent report review "monitors" responsible for ensuring that the report review criteria have been satisfied. After all

[9] The NRC conflict of interest disclosure process (National Research Council, 2003) is often cited as a high standard for documenting independence and objectivity in science and technology advisory bodies; see, for example, U.S. Office of Management and Budget (2005).

[10] Most groups created by the U.S. Government to provide advice operate under regulations pursuant to the *Federal Advisory Committee Act* (FACA), which does not permit, for example, such groups to operate without government officials present or in meetings not open to the public (along with many other requirements). The NRC operates under a special provision of FACA (Section 15) that permits closed committee meetings. Section 15 of FACA is included for reference as Appendix A.

[11] This is, in part, necessary because study statements of task are contractually defined and, hence, sometimes result in committee's frustration at not being permitted to exceed the statement of task if the committee feels an expansion of the scope in warranted. It is generally considered the role of the institutional governance structures to ensure that a study's statement of task is properly framed.

committee members and appropriate academy officials have approved the final report, it is transmitted to the sponsor of the study (usually a government agency) and subsequently released to the public. Sponsors are not provided an opportunity to suggest changes in reports. The names and affiliations of the report reviewers are made public when the report is released.

STAGE 5: Publication and Dissemination

NRC reports are sometimes delivered and released to the public in the final published form, but more frequently are delivered and publicly released in a pre-publication draft format, and subsequently edited and produced in a final published form some time later. Press briefings, congressional and executive agency briefings, and other dissemination activities are common for many NRC studies.

Special Challenges for NRC Study Processes

Over the years the NRC process has proved consistently to be a very strong model for providing independent and authoritative advice to government. Like any process designed to serve many needs, however, it is not perfectly tuned to serve all the needs of all parts of government that need science and technology advice. The most commonly cited issues and challenges associated with the NRC study process are the following:

- **Cost.** It is often perceived to be expensive to commission an NRC study, even though committee members are volunteers whose time is contributed *pro bono* (except for travel expenses). At least in part this perception is due to the fact that a separate contract is negotiated for each individual study—unlike the central funding for federal agency advisory committees. The overhead cost for the NRC is necessarily substantial, partly because many of the staff supporting studies are professionals who manage the activities of standing boards and committees as well as study committees and partly because supporting the infrastructure necessary to maintain access to key sources of volunteers, including the governance structures of the National Academies, must be maintained. In general, the cost of an NRC study is perhaps somewhat higher than that of a comparable effort carried out by a university or nonprofit "think tank" and somewhat less than that of a commercial management consulting firm.
- **Timeliness.** The NRC study process, which includes commissioning and contracting for the study, selecting and convening a study committee, arranging subsequent meetings among busy experts who are often in high demand and serving on a volunteer basis, and navigating a report through peer review, editing, production, and release takes time. The average (with a very wide variance) duration of an NRC study is about 18 months, but can be longer, especially for controversial topics. Congressionally mandated studies involve additional complications as well (discussed below). It should also be noted, however, that studies can also be carried out quite rapidly given an important national need. *Making the Nation Safer,* noted above, was completed in six months. Another widely cited study, *Climate Change Science,* was completed in one month and the recently completed report, *Rising Above the Gathering Storm,* noted earlier was completed in six months.
- **Sources of Sponsorship.** Most NRC studies are commissioned and paid for by federal agencies through contracts (at least one per study undertaken and sometimes many contracts per study from multiple agencies). Studies are funded from other sources as well (sometimes in addition to federal agency sponsorship), such as foundations or even limited sponsorship from private sector sponsors or even States. Studies mandated by Congress also require the additional hurdle of enacting a federal law directing an agency to contract with the NRC. On the one hand, the practice of negotiating studies individually, whether there are multiple sponsors or not, is beneficial in that it can help ensure that the studies the NRC undertakes are relevant and important. Also the diversity of financial sponsorship for a large portfolio of studies from many executive agencies (see Figure 1) helps assure independence, especially by minimizing the dependence of the NRC's financial support on any one federal source. On the other hand, it often takes six to nine months through a government procurement process to initiate an NRC study even after a mandated study has been enacted in law (or included in the legislative report language accompanying passage of the law). For those studies mandated by Congress, yet an additional delay often results from the time needed to implement the legislation. While it has been sometimes suggested that the Acad-

emies consider requesting an annual appropriation of funds from Congress (probably executed as a task order contract with a relevant federal agency) to facilitate improved administrative efficiency in carrying out studies (e.g., reducing the time for securing individual contracts for studies), the Academies' leadership has historically been unwilling to consider this option, since such an arrangement could lead to compromises in institutional independence.

- **Committee Authorship.** NRC study committees of experts, widely considered to be a key strength of the NRC study approach, include widely respected individuals from academia, industry, and essentially all groups relevant to the study committee's charge. However, the volunteer committee of experts as authors of the report can also sometimes be a weakness. For example, NRC committees are made up of distinguished volunteers who have many other responsibilities in their professional lives. Without careful oversight by the committee chair and sometimes NRC management, committee members with the most at stake in a study or perhaps with the most available time to commit to the effort could have a disproportionate influence over a study's deliberations and outcomes. This is why the NRC places such a high priority on recruiting strong chairs, providing experienced professional support staff in managing committees, and executing rigorous procedures for identifying and addressing potential bias and conflicts of interest of prospective committee members. Committee members who attempt to abuse their responsibilities as committee members can be removed while a study is under way.

A CURRENT GAP IN ADVICE TUNED TO CONGRESSIONAL NEEDS

As just outlined, the NRC study process is well developed and serves one important need of Congress—providing an authoritative recommendation from widely recognized experts on a specific course of action. In particular, NRC committees are usually assembled with the intention of achieving consensus recommendations supported by evidence and subject to rigorous peer review. In a very controversial subject area with scientific and other uncertainties, if a broad set of perspectives are included in the study committee a consensus might be difficult to achieve, particularly if the purpose is to include all possible scientific and other perspectives on a problem or if complex policy considerations are involved. This is why the NRC places a high priority on an appropriately balanced committee and a rigorous information-gathering phase of a committee's work, where such perspectives can be heard and considered by the committee.[12]

Since the historical focus of the NRC process has been on delivering consensus-based advice, the process as it has evolved is less well equipped to elaborate on the broader context of an issue and inform the policy debate with careful and objective analysis of the policy consequences of alternative courses of action, especially those that may involve value judgments and social or economic trade-offs beyond the scope of technical analysis. Consequently, it has been less common for the NRC to assemble committees charged with identifying and evaluating the pros and cons of a range of alternative policy options, although such committees are sometimes created and it would certainly be possible to develop such a study process to be used more widely at the National Academies.

Both types of analysis just described are important to congressional deliberation depending upon the circumstances. With the closure of the former OTA, organizations focused on the latter type of analysis, either performed by a disinterested analytical organization within the Congress itself or readily accessible to the Congress from an external organization, do not currently exist and may at some point need to be reconstructed, perhaps involving the National Academies in some way.

Example: The Future of the U.S. Electric Power System

As an example illustrating the analysis gap just noted, consider the case where the U.S. Congress may be interested in the future of the electric power system following a major blackout. The salient issues could be posed in two alternative ways:

- One type of study would be to seek an authoritative set of recommendations for making the system more secure and reliable. In such a study, the well established NRC approach would be to assemble a committee of widely recognized experts. The Committee would review what is known about the power

[12] While NRC study committees strive by design to produce consensus findings and recommendations, academy policies and procedures do provide for publishing dissenting views when consensus cannot be achieved.

system and currently expected paths of continued development and then prepare specific engineering, technology and operational recommendations about how to improve system reliability and performance. Indeed, such a study is currently underway at the NRC sponsored by the new U.S. Department of Homeland Security.

- In another type of study, Congress might be interested in exploring the technical as well as societal, environmental, economic, regulatory, or other broad implications of alternative scenarios of increasing competition in the Nation's electric utility industry, perhaps once again precipitated by a blackout widely perceived, correctly or not, to be the result of deregulation. Not only technical, but also political, economic, social, environmental, and probably many other kinds of tradeoffs and value judgments are involved in characterizing a series of scenarios for the future structure of the industry, ranging from moving toward a national centrally controlled electric supply grid to fully deregulating wholesale and retail electricity segments of the industry.

In the latter case a definitive set of consensus recommendations is not the objective, and the collection of stakeholders and experts necessary to carefully identify and explore these alternatives would be considerably different than for the study committee structured to reach fact-based, tightly reasoned consensus recommendations based on scientific evidence and on specific technical issues. Rather, the objective would be to articulate the implications of alternative scenarios and accompanying policy decisions, usually at a higher level of abstraction than the former case.

In short, and perhaps at the risk of being simplistic, the first type of analysis is designed to *illuminate the scientific and technical aspects of a problem to help direct a specific course of action* while, in the second case, the analysis is designed principally *to inform the debate, including perspectives that may go beyond science and engineering.* Both types of analysis are very important to Congressional deliberations. The contrasts between these two types of analysis are discussed below in a more detailed comparison of the NRC process with that of the former OTA. As noted above, the fact that the NRC process does not now generally accommodate this second form of advice does not mean that it could not; the NRC often considers and implements changes in its processes in response to government needs, although going beyond the tradition of fact-based studies with a science and technology focus to more policy-oriented studies could pose risks to the NRC's credibility so such changes would have to be implemented very carefully.

Real-Time Advice: A Continuing Imperative

As a case in point of the evolution of NRC processes, the horrific terrorist events of September 11, 2001 in the United State spurred widespread interest in finding ways to contribute to the understanding of the science and technology dimensions of homeland security and countering terrorism. Specifically, many government agencies expressed urgent needs for immediate advice in these areas. In response, the NRC experimented with using its convening power to assemble small groups of experts who then provided advice as individuals, rather than as a group constituting an NRC committee. Such "real-time" advice, which does not result in a written report and does not carry the imprimatur of the NRC process (especially the quality control aspects of committee deliberation and peer review of a written report) does not constitute formal advice of the Academy to government. It has, however, provided a new means of satisfying a real government need, i.e., providing timely input to policy-makers and other organizations, including, as an example, a standing arrangement with the Government Accountability Office (GAO), an agency of the Congress, discussed further below.

Additional Congressional needs vary widely, including such deliverables as (1) "instant education" on a complex science and technology issue, (2) "translations" of authoritative technical reports to more readable and understandable language tuned to the needs of policy-makers with very broad responsibilities, (3) summaries of landmark authoritative reports, and (4) updates or adaptations of existing reports and information to current needs, and (5) readily available and trusted expert consultants on call to help with quick turnaround questions and interpretations of complex technical information. Some of these capabilities are accessible to the Congress to varying degrees through the Congressional Research Service, but others, especially (1) and (5) are not currently generally available to the Congress, at least in any organized or readily accessible way by an organization directly accountable to Congress.

Collaboration and the GAO Experiment

In an experiment referenced above to test the feasibility of developing a "technology assessment" capability in another Congressional support agency, the Government Accountability Office (GAO), a first-of-a-kind GAO technology assessment report on biometric technologies was released in 2002.[13] While the NRC was not involved in developing this assessment, it was asked to use its contacts to assist the GAO in identifying individuals with the proper expertise. In retrospect, there are a number of shortcomings in the approach adopted by the GAO in carrying out its first attempt at a technology assessment, most notably the lack of a substantive and accountable peer review process, but the experiment was more successful than many anticipated and the GAO seems receptive to incorporating improvements suggested by a group commissioned to review the GAO approach (see Fri et al., 2002). In particular, the group identified a number of significant organizational challenges that it felt were necessary to refine the GAO approach, which could then possibly evolve into a more mature technology assessment capability within the legislative branch of government. The GAO technology assessment experiment is continuing at a modest scale of one to two assessments annually on selected topics.

Whether the GAO is ultimately capable of the reforms identified by the independent review panel remains to be seen, but it seems fair to conclude that the initial GAO experiment has yielded evidence sufficient to continue the experiment. The NRC's modest role in this experiment, by convening groups of experts to talk with GAO study teams, appears to have been one of the successful features of this approach and may constitute one way in which the National Academies can contribute to a renewed technology assessment capability within the legislative branch, in addition to its more traditional response to congressionally mandated requests for assistance. The NRC's relationship with GAO also includes, more generally, a standing arrangement to assemble experts to talk with GAO staff on a specific set of technical issues relevant to ongoing GAO studies. Such a mechanism provides the GAO a degree of access to the National Academies' considerable network of technical experts.

THE FORMER OFFICE OF TECHNOLOGY ASSESSMENT

The GAO experiment was designed to help fill the gap in science and technology advice for Congressional needs left by closure of OTA. By comparison and contrast with the NRC study process, the OTA study process used an authoritative committee of volunteers as an advisory panel rather than in the role of assuming authorship of the study itself. The study report was, instead, produced by professional staff subject to external review. On one hand, this approach permitted easier regulation of the role of the committee, particular if achieving a consensus in a broad controversial area was unlikely, but, on the other hand, such a practice also sacrificed the authoritativeness of the "best and brightest" volunteer experts identified as authors of the report, an important feature of the NRC process.

Because the former OTA panels were advisory, and not the report's authors, the necessity of reaching a consensus was seldom an issue. Indeed, OTA was prohibited in its enabling legislation from making recommendations, so the panel was created to try to collect the views of all important stakeholders rather than to try to produce consensus recommendations. This sometimes resulted in a frustrating experience for panelists serving on OTA advisory panels who were eager to offer specific recommendations. Instead, OTA project teams sought to analyze and articulate the consequences of alternative courses of action and elaborate on the context of a problem without coming to consensus recommendations on a specific course of action, which would be difficult anyway with a diverse group with points of view that prevented consensus on many controversial issues. In the later years of the agency's existence OTA reports included more and more specific *findings* as a carefully developed alternative to recommendations.

If required to deliver a consensus set of recommendations, even if it were permitted under the enabling legislation, the former OTA model would likely be unworkable for controversial subjects with many opposing points of view. Nonetheless, the type of study undertaken by the former OTA was an important input to Congressional deliberation and it has not yet been reproduced in the Legislative Branch agencies or elsewhere, including the National Academies. The Academies could

[13] Since 1996 members of Congress at various times have proposed experiments to fill the perceived gap in science and technology advice in the wake of closure of the OTA, including attempts to simply resurrect the agency; see Jones (2004) and Knezo (2005). One such experiment that has come to pass is creation of a "pilot" technology assessment capability in the Government Accountability Office, a support agency of the Congress. The first such assessment (GAO, 2002), was released in November 2002.

probably carry out more such studies but that would likely require some significant changes in its study procedures to accommodate such studies as indicated above and in more detail below.

OTA's Organizational Structure

OTA operated under Congressional authorization provided in the *Technology Assessment Act of 1972* and funds were appropriated in 1973 to begin operations in 1974 with a handful of staff that grew to 200 in the later years of the agency's existence. The staff structure included a core permanent staff of 143 that was supplemented with temporary staff recruited to meet the needs of current assessments. Both permanent and temporary staff included professionals from many disciplines, over half with Ph.D.s. OTA produced on average 32 reports per year over its history and 51 reports per year in its last three years of its existence.[14]

The key organizational elements created in OTA's enabling statute were (1) the Technology Assessment Board (TAB) composed of members of both chambers of the U.S. Congress, the House of Representatives and Senate; (2) a Technology Assessment Advisory Council (TAAC), composed primarily of private citizens appointed by TAB; and (3) the Office of the Director, which oversaw day-to-day operations of the agency.

- **Technology Assessment Board.** TAB was the central organizational element articulated in OTA's enabling statute with its composition unique among the legislative support agencies.[15] TAB was a 12-member governing board of OTA, with six members of the Senate and six of the House of Representatives, divided equally between the two dominant U.S. political parties. The principal responsibilities of TAB were to appoint the Director, to authorize the initiation of assessments requested by Congressional Committees, to approve the budget authority associated with those assessments, and finally to authorize delivery of assessment reports to requesting committees and the public by certifying that OTA has carried out its assessment process faithfully, i.e., that OTA had considered all the relevant stakeholder interests and issues and undergone extensive external review. OTA received an annual budget appropriation from Congress allocated to OTA's support operations and among OTA active projects as authorized by TAB.
- **Technology Assessment Advisory Council.** TAAC was essentially OTA's outside visiting committee. It was appointed by TAB and met periodically to review the overall direction of the agency and carry out more detailed reviews of the agency's research programs.
- **Office of the Director.** The OTA Director was responsible for day-to-day operations, hiring and management of staff, interaction with TAB and TAAC, and strategic planning for and organization of the agency.

OTA's Process of Technology Assessment[16]

As noted above, OTA generally undertook assessments at the request of the Chairs of Congressional Committees. Typical OTA assessments took 18–24 months to complete and cost on the order of $500,000 (1996 dollars) in direct costs (although indirect costs essentially doubled the total cost).[17] OTA assessments seldom offered specific recommendations. Rather, they articulated policy options and the consequences of alternative options.

A great deal of effort went into defining the scope of an assessment once it was requested by a Committee Chair. Since OTA frequently received many more requests than it could accommodate, the project directors often consulted with other congressional committees of jurisdiction and interest as well as with the TAB informally to help establish study priorities fairly. Once a general study scope was established, a proposal was prepared for formal consideration by TAB and, if approved, the assessment commenced. The portfolio of assessments addressed a broad range

[14] The entire collection of OTA assessments delivered during the agency's history (1972–1995) is preserved electronically and available at *http://www.wws.princeton.edu/ota/* and on a CD–ROM collection (Office of Technology Assessment, 1996).

[15] During OTA's existence, there were four Congressional analytical support agencies: the Library of Congress's Congressional Research Service (CRS), the General Accounting Office (GAO) [GAO's name was changed to the Government Accountability Office in 2004), and the Congressional Budget Office (CBO). CRS, GAO, and CBO remain in operation today.

[16] OTA's assessment process is documented widely in the literature, including Guston (2003), Bimber (1996), and many others.

[17] As noted earlier, OTA delivered on average 51 reports per year during the last three years of the agency's existence.

of subjects on the Congressional agenda, such as energy and environmental technology issues, proliferation of weapons of mass destruction, global telecommunications policy, biological pest control, and health care reform. The key elements of an assessment typically were the following:

- a comprehensive advisory panel of technical experts and relevant stakeholders;
- a core OTA project team including an experienced project director;
- contractors and consultants selected to support major analytical tasks;
- in-house research efforts by the project team;
- workshops convened with additional experts and stakeholders to obtain the most current information possible;
- extensive review and comment of draft reports by external technical experts and stakeholder interests;
- and, finally, delivery of reports through congressional hearings, briefings, and public release, and often considerable follow-up consultation with requesting congressional committees of jurisdiction and interest.

OTA advisory panels were an important feature of OTA's assessment process. They helped refine the project scope, identified additional relevant resources and perspectives on the issues being addressed, and provided the core of extensive peer review. The advisory panel was central, but OTA took responsibility for the final product. The agency did not seek consensus from the panel because most often if there were a possible consensus decision or course of action, OTA probably wouldn't have been asked to do the study in the first place. The principal final product of an OTA assessment was a report, along with summaries, report briefs, personal briefings for members and committees, commercial publishers' reprints, and in the final years of the agency's existence electronic delivery of these products over the Internet and via Capitol Hill's local area network.

At the highest level of abstraction, the OTA assessment process is similar to the NRC study process in that it also can also be defined in terms of a sequence of five major stages similar to those of the NRC process. However, each stage has significant differences in their details compared with the corresponding stages in the NRC process. The stages to the OTA process were the following: (1) project selection, (2) project planning and preparation, (3) project execution: data collection, analysis, and report preparation, (4) report review, delivery and publication, and (5) report dissemination, use and follow-up activities.

STAGE 1: Project Selection

OTA worked principally for the Committees of the U.S. Congress, and, hence, projects were generally initiated as a result of inquiries from Congressional committee staff ultimately resulting in formal letters of request from Committee Chairs and ranking members (and often from more than one committee of jurisdiction or interest). Projects could also on occasion be initiated at the request of TAB or by the OTA Director with TAB's approval, although such studies were rare. In practice, OTA staff became what former TAB Chair Senator Ted Stevens referred to as "shared staff" for standing House and Senate Committees and studies were often initiated as a result of ongoing interaction between Congressional Committee staff and OTA staff.

A great deal of preliminary work often went into the planning for a new OTA assessment. Usually this work involved preliminary data collection and literature research, including reviewing relevant legislative history, congressional committee hearings and reports, and reports from other Congressional agencies (CBO, CRS, and GAO), all to help frame the issues for the project proposal and work plan. The major product at this stage in the assessment process was a proposal which first was approved internally by the OTA Director for consideration by TAB for review and approval. The proposal included a detailed work plan and budget proposal, and, if approved by TAB, resources would be set aside out of OTA's annual appropriation to carry out the assessment.

STAGE 2: Project Planning and Preparation

Following TAB approval, a project team of two to six professional staff was appointed. Usually the project director was a permanent staff member with experience in prior OTA assessments supplemented with additional senior and junior staff members who were either permanent staff or rotational (temporary) staff recruited for specialized skills needed to carry out the assessment. Overall, the research and writing of OTA assessments was principally conducted by a staff of about 200, of

which two-thirds were the professional research staff. In the early 1990s, among the research staff, 88 percent had advanced degrees, 58 percent with Ph.D.s, primarily in the physical, life, and social sciences, economics, and engineering. About 40 percent of the research staff were temporary appointments of professionals recruited specifically to staff ongoing assessments. For specific information or analysis, OTA also contracted with key individuals or organizations. Contractors analyzed data, conducted case studies, and otherwise provided expertise to complement staff capability.

The project team assembled a slate of nominees for the project's advisory panel by defining the major stakeholder interests in the issues to be addressed, the important science and technology expertise relevant to the assessment, and other interests as necessary to capture a very broad range of perspectives on the study scope. The advisory panel slate was submitted for approval through OTA management and ultimately approved by the Director, often with revisions or additions to the originally proposed slate. The project team organized and commissioned the portfolio of contractor support tasks, assigned internal analysis tasks, information gathering workshops, and other activities as specified in the work plan.

STAGE 3: Execution: Data Collection Analysis and Report Preparation

Carrying out the assessment itself was typically organized around meetings of the project's advisory panel. The panel's principal responsibility was to ensure that reports were objective, fair, and authoritative by helping to shape studies in the early stages by suggesting alternative approaches, reviewing documents throughout the course of the assessment, and critiquing reports at the final stages. The panels typically met three times during a study, initially to help frame the study, second as an opportunity to effect "mid-course corrections" and, finally, as the point of departure for the initial and perhaps most important part of peer review of the draft report.

In addition to the advisory panel, many others assisted with OTA assessments through participation in technical workshops, provision of background information, and review of documents. Commissioned contractor reports, invited papers contributed to workshops, internal working papers prepared by professional staff, and interaction with parallel studies on-going in other organizations all helped shape the body of information considered as the staff began to prepare the assessment report. In all, nearly 5,000 outside panelists and workshop participants came to OTA annually to help OTA in its work.

The role of contractors in an OTA assessment evolved considerably over the agency's history. In the early years commissioning external contracts were perhaps the dominant part of a study. Over the years as the agency's professional staff developed and became much more attuned to Congressional needs, contractors were used less, but were often an important part of an OTA assessment.

STAGE 4: Report Review Delivery and Public Release

OTA placed a very high premium on clearly written reports that effectively communicated very complex topics to Congressional staff and the public. This involved writing reports specifically tuned to Congressional needs, such as language suitable for and relevant to broad policy discussions, extensive examples, and illustrative anecdotes helpful for framing policy debates. Also, as noted earlier, no attempt was made to develop a consensus among panel members; in fact, a wide diversity of views was sought. OTA retained full responsibility for the content and conclusions of each report. OTA draft assessment reports went through extensive formal review and revision conducted by OTA staff and outside experts. Some outside reviewers examined portions of the report while others the entire report and the total number of reviewers involved often exceeded 100 individuals.

Accompanying a final draft report for consideration by the Director was a "response to review" memorandum prepared by the project director that reviewed all comments received on the draft report and how they were dealt with in producing the final draft report. Upon the Director's approval of the final draft assessment report and its response-to-review, copies of the final report were sent to TAB for its review and authorization for publication. If approved by TAB, published reports were then forwarded to the requesting committee or committees, summaries and one-page report briefs were sent to all Members of Congress, and then the report was released to the public. OTA assessments were published by the Government Printing Office and were frequently reprinted by commercial publishers.

STAGE 5: Dissemination Use and Follow-up

Upon delivery of a published OTA assessment report to sponsors and public release, frequently congressional hearings and briefings followed. Reports were disseminated widely to the relevant policy communities, and frequently OTA staff prepared publications based on the report for peer reviewed journals or other publications. OTA reports were often reprinted by commercial publishers (as a government-produced document, OTA reports carried no copyright), and in the final years of the agency's existence electronic delivery over the Internet and via Capitol Hill's local area network became standard practice. Finally, senior OTA staff involved in the effort often became subject matter experts called upon frequently by congressional staff and members as legislative initiatives were considered in the subject area addressed by the assessment. As noted earlier Senator Ted Stevens often referred to OTA project teams as "shared staff' experts in science and technology supporting congressional committee staffs where such expertise was often scarce.

THE NRC AND OTA STUDY PROCESSES COMPARED

Some of the differences between the NRC and OTA study processes as they relate to studies requested by Congress have already been noted and in some ways the processes are more similar than they are different (see Figure 2). Both involve a carefully bounded and defined scope of work culminating in a formal study request, usually in the form of a letter or congressional legislation. In both cases the scope of work is formally documented with a proposal and work plan, although in the case of the NRC the proposal takes the form both of an internal study prospectus to be approved by the NRC Governing Board[18] as well as an external contract proposal to formalize the funding sources with the sponsoring federal agencies (or sometimes other organizations). In the OTA case, the TAB authorized approval of expenditures for the study against the agency's annual appropriation. The mechanism of project funding is one of the fundamental differences between the two approaches (discussed more below), but there are many other differences as well.

Role of Volunteer Committee

The role, purpose and even composition of study committees in the NRC case and advisory panels in the OTA case are quite different in several respects, some of which were noted above. In the NRC case the committee assumes authorship of the report while in the OTA case the committee is advisory to professional staff who draft the report. The quality of the study in the NRC case is much more dependent upon quality of the committee recruited to carry it out, which explains why considerable effort is spent on recruiting high quality committees for NRC studies. Such was the case for recruiting OTA advisory panels as well, but the success of the study was relatively less dependent on the role of the advisory panel.

The quality of the staff project team was the dominant consideration in the OTA case. As noted above, members serve *pro bono* on NRC committees while in the OTA case a modest honoraria for service by advisory panel members was occasionally provided. NRC committees are generally recruited with the intention of coming to a consensus regarding findings, conclusions, and recommendations included in the committee's report. In the OTA case the goal was instead to have all legitimate interests in the policy area under study represented on the advisory panel with no expectation of reaching a consensus view. Finally, because in the NRC case the committee assumed authorship of the report, elaborate institutional procedures for avoiding conflicts of interest are a high priority. In the OTA case, since the goal of the advisory committee was to include all legitimate interests, conflicts of interest were essentially encouraged, although carefully balanced in the committee composition.

Role of the Professional Staff

As a consequence of the differing roles and structure of NRC committees vs. OTA advisory panels, the roles of the professional staff in the study process are generally quite different as well. In the NRC case, the principal responsibilities of the staff are to plan, organize and structure the study, initiate selection of the study committee membership, and facilitate the committee's work, including ensuring adherence to the policies and procedures established for NRC studies.[19] However, as noted above, even though NRC committees assume authorship of the study report,

[18] Technically, this approval is delegated by the Governing Board (which meets quarterly) to its Executive Committee (which meets monthly).

[19] In practice the degree to which the NRC staff members are involved in drafting a committee report varies widely. In some studies staff members become very actively involved in the substance of the committee's work while in others staff principally facilitate the committee's work.

in practice draft reports for the committee's critique and consensus are produced in a variety of ways, and frequently involve committee member drafting, committees critiquing drafts prepared by staff, and collaborative combinations of committee and staff authorship. In the OTA case the professional staff members planned and managed the assessment, and took responsibility for the report as the study authors. Finally, OTA staff were also Legislative Branch government employees with frequent day-to-day interaction with Congressional staff and Members before, during, and after completion of OTA assessments.

Requests to initiate studies

Most congressionally requested NRC studies require that the study be mandated in law or specified in a legislative report accompanying the law when passed by Congress. Otherwise it is unlikely that the relevant executive agency would be willing to provide the funding to support the study. On rare occasions, letters of request from Members of Congress lead to studies funded by internal resources of the National Academies. In the OTA case by far most studies were requested by Chairs and Ranking Members of standing committees of either or both chambers of the Congress, although studies were sometimes also mandated in law (although still subject to approval by TAB).

Funding of studies

Most NRC studies are funded by executive agencies through a sole-source (non-competitive) contract or grant or in some cases an individual task negotiated as part of a task order contract. Sometimes funds for congressionally mandated studies are provided in appropriations legislation. Often, though, mandated studies are specified in authorizing legislation or report language accompanying legislation and agencies may or may not choose to make funds available to carry out the study. In the OTA case, funds for virtually all studies were drawn from the agency's annual budget appropriation for the agency's operations and were allocated when the study proposal was approved by TAB.

Government Oversight of Policies and Procedures

As an independent, private, non-profit organization, many of the same laws that apply to such organizations apply to the National Academies, especially those related to, for example, employment practices or contracting and financial auditing requirements. In addition, special additional policies apply, such as Section 15 of the *Federal Advisory Committee Act* (see Appendix A) and several Presidential Executive Orders[20] applicable to the National Academies charter and mission. So, while there are many government oversight mechanisms that apply to specific individual academy policies and procedures, there is no direct overall oversight relationship with the government.

By contrast, as a Congressional agency, OTA had many fewer operational government oversight mechanisms while the agency had three direct oversight mechanisms within the Congress itself. (1) TAB, which was ultimately responsible for managing the agency, (2) the Senate and House Appropriations Committees where OTA's operating budget was establish as part of the annual Legislative Branch appropriations process, and (3) standing committees of the House and Senate (Senate Committee on Governmental Affairs and the House Committee on Science) with responsibility for oversight of OTA's authorizing statute.[21]

Government oversight of study scope

As noted above the mechanism for controlling a study's scope for an NRC study is the contract or grant with a federal executive agency responsible for the funds to sponsor the study. Sometimes differences between congressional expectations, as articulated in the legislative language mandating the study, and the contract language with the designated executive agency can be difficult to resolve to the satisfaction of all concerns. In the OTA case the mechanism for controlling the study scope was ultimately the responsibility of TAB.

Report peer review mechanisms

NRC reports are subjected to an independent and anonymous peer review process. That is, the study committee is obliged to respond to comments from peer reviewers

[20] The NRC was included formally under the charter of the NAS with a Presidential Executive order signed by Woodrow Wilson in 1918 and reaffirmed and revised in 1956 and 1993 (see Executive Office of the President, 1993).

[21] Technically, OTA's authorizing statute, the *Technology Assessment Act of 1972* (U.S. Code, Title 2, Chapter 15, Sections 471–481), was never repealed by Congress so the agency does not exist only because funds are no longer appropriated for its operations.

whose identity is unknown to the committee until after the report is published. Reviewers are selected through a process overseen by the executive offices of the NRC's major program divisions and the Report Review Committee (RRC), which is a National Academies committee independent of all involved in preparation of the study report. Judgment of the adequacy of a committee's response to review is managed by the RRC. Typically 10–12 reviewers provide detailed comments on the draft report. In the OTA case, while there were as many as 100 reviewers engaged in reviewing parts or all of a draft OTA report, the reviewers were generally selected by the OTA project team but often supplemented with reviewers selected by senior OTA management. The OTA project director drafted the response to review subject to the approval of senior OTA management and ultimately TAB.

Nature of Reports

As noted above, NRC reports are usually designed to yield consensus findings, conclusions, and recommendations from an authoritative committee regarding a specific course of action. OTA reports generally did not include specific recommendations but, rather, were designed to articulate the consequences of alternative options without selecting a preferred option, although, as noted earlier, in the later years of the agency's existence OTA reports included more and more specific *findings* as a carefully developed alternative to recommendations. It is perhaps important to note that in neither of the NRC or OTA cases is the intention of the study report to produce new technical understanding. Indeed, in both cases the intent is to collect and make understandable to broader audiences, particularly policy makers, established perspectives on the current understanding of the issue(s) under study.

Report Delivery and Dissemination

In most cases dissemination of NRC reports is limited to delivery to executive agency sponsors and relevant congressional committees and released to the public through the National Academies Press and made available on the National Academies Internet site. Often the report is initially released in a pre-publication draft format in order to effect as timely as possible delivery of the information to the sponsoring agency and the public. The final printed report, including editorial but no substantive changes to the report content, follows later as published by the National Academies Press (NAP) and made available on the academy Internet site. The National Academies holds the copyright on the report and the NAP offers copies of most reports for sale to the public and all reports available without charge on the academy Internet site. Occasionally, the committee chair and some committee members participate in agency or congressional briefings of the report or provide testimony for congressional hearings. OTA reports, along with accompanying summaries and report briefs, were widely distributed upon public release and were available for sale through the Superintendent of Documents (Government Printing Office) and made available without charge on the agency's Internet site. OTA staff frequently provided congressional briefings and testimony and occasionally executive agency briefings as well as often preparing papers and summaries based on the report for the peer reviewed literature.

Follow-up Activities

For the most part, when NRC reports are delivered to sponsors and publicly released, the committee's work is largely over, except for dissemination activities noted above. Occasionally committees are re-convened for follow-up studies or committees are empanelled in the first place with the intention of producing a series of reports, such as an annual review of a Federal R&D program over a period of years. In the OTA case, initial report dissemination activities were similar to the NRC routine, but with much more focus on the Congressional audience, as one might expect. However, it was also very common for smaller scale follow-up background papers on topics included in the assessment to be requested by Congressional committees. In addition, OTA staff members were consulted frequently by congressional committee staff on an ongoing basis in areas where OTA assessments had been completed, often for many years following the completion of a major assessment.

CONCLUSIONS

The reputation of the National Academies as a trusted source of advice for government on science and technology issues is due not only to the quality of expertise the NRC is able to involve in its work but also to the highly structured process guiding NRC studies that has evolved steadily over many years. The goal of this process, which includes many features of quality control and assurance relating both the process by which the advice is generated and the report documenting that advice,

is to maintain balance and objectivity throughout a committee's work and to produce reports considered to be both unbiased and authoritative.

The National Academies have enjoyed a longstanding and effective working relationship with Congress on even the most controversial issues. There are, no doubt, many characteristics of that relationship that could be improved, both to perform the traditional NRC role more effectively and to provide some opportunities to expand that role. However, effective science advice in the unique policy making environment of the Congress is a complex undertaking (see Smith and Stine, 2003). There are a variety of options for filling the gap in analysis capabilities left in the wake of the closure of OTA, some of which might involve the National Academies (see Morgan and Peha, 2003).

Many features of the OTA assessment process were similar to those used currently by the NRC, but as outlined in this paper, there are fundamental differences as well. The OTA process was well suited to a broad policy context, paralleling that of congressional deliberation, where the questions involve the relationship of science and technology to broader economic, environmental, social and other policy issues where many legitimate courses of policy action are possible and any consensus view with all stakeholder views represented is most unlikely.[22]

As an example of this contrast between the two approaches (illustrated also by the electric utility industry case described earlier), consider the case of federal policy on fuel economy regulation of automobiles. In the early 1990s both the OTA and the NRC were asked to consider the subject of improving automotive fuel economy and, more specifically, the feasibility of increasing fuel economy standards to achieve better fuel efficiency in the Nation's auto fleet. The OTA report elaborates on the various trade-offs associated with raising standards versus alternative policy mechanisms for achieving automotive improved fuel economy (OTA, 1991). The NRC study (1992) much more specifically comes to conclusions regarding the technical feasibility of various proposed standards and provides a specific recommendation on a particular set of standards that, in the opinion of the committee, is technically feasible while having minimal or at least acceptable market disruption. The NRC deliverable required that a committee of experts reach a consensus and the recommendations are widely considered authoritative. The OTA study could seek consensus on facts and analysis (although the process did not require it because the panel of experts was advisory), but it did not come to a specific recommendations regarding the standards, partly because the agency's charter precluded coming to a specific recommendation in the first place and partly because the advisory panel was assembled with the broadest range of stakeholders and would likely not have been able to reach consensus anyway.

OTA-like Features Emerging in the NRC Study Process

It is interesting to note that in 2002 the NRC issued a new report on fuel economy standards (NRC, 2002) where alternative mechanisms for achieving improved U.S. automotive fuel economy were addressed, moving in the direction of an OTA assessment, although by far the most referenced portions of that report remain the identification and evaluation of the technical potential for improving fuel economy. In another more recent case, the academy report, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (NRC, 2005), is very similar in scope to an OTA assessment with the added benefits of a highly prestigious committee identified as authors of the report and very specific recommendations offered.

Although not carrying the 100-year-old imprimatur of the National Academies, OTA's reports developed a reputation for being authoritative as well, but OTA's strength was more, as the late George Brown, once Chair of the TAB and of the House Science Committee, put it, a "defense against the dumb" by elaborating on the context of an issue and informing the debate with careful analysis of the consequences of alternative courses of action without coming to a recommendation of a specific course of action, which often involved value judgments and trade-offs beyond the scope of the OTA analysis.

As noted earlier, both types of analysis just described are important to congressional deliberation depending upon the circumstances, but with the closure of the former OTA, the latter type of analysis neither exists within the Congress itself nor is readily accessible to the Congress. The "OTA style" of analysis could be very useful for many executive agency needs as well.

[22] The reasons Congressional leadership gave for closing OTA in 1995 were not so much related to the quality of the advice the agency provided to Congress but to the timeliness of its delivery; see Walker (2001) and Dawson (2001).

Some OTA-like features have evolved over time with NRC studies. For example, the IOM[23] now increasingly hires staff for new studies who are recognized experts themselves in a particular area to work on studies and who consequently take a more active role than was the previous custom in drafting the committee report. This method can increase the already high cost of doing NRC studies, but it has the benefit of increasing the capacity of the study committee to assemble background information efficiently, both as a basis for deliberation and for providing background documentation for the report that would likely not have been included. That is, the report now has more information that can be used both to inform the ultimate decision of the sponsor and to help rationalize the recommendations of the study committee in a more comprehensive manner. Additional OTA-like features are certainly possible at the National Academies, and in some cases such features are already being introduced, but many internal and external control issues outlined in this paper would have to be resolved for the NRC to incorporate many features of the role OTA played on Capitol Hill.

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[23] The IOM administers a collection of program activities that operate under NRC policies and procedures, although formally they are not part of the NRC.

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Figure 1

PROGRAM SUPPORT BY SOURCE FOR FY2005

Estimated Total Expenditures of $240.3 million

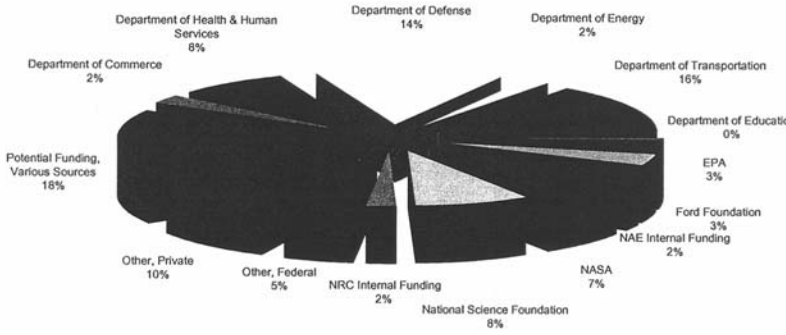
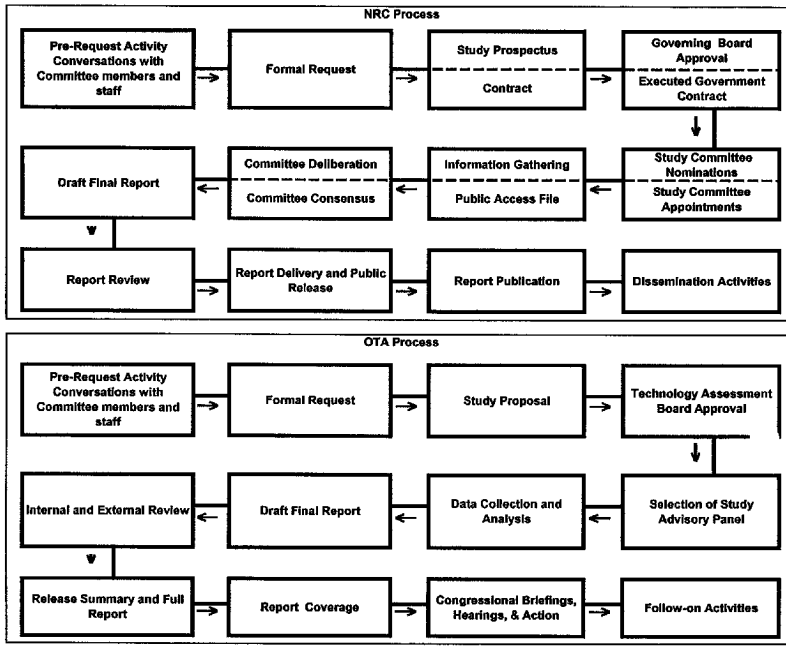


Figure 2
The NRC and OTA Study Processes Compared



APPENDIX A:

Section 15 as amended of the Federal Advisory Committee Act

(PUBLIC LAW 105–153, 105TH CONGRESS, APPROVED DECEMBER 17, 1997)

(a) IN GENERAL.—An agency may not use any advice or recommendation provided by the National Academy of Sciences or National Academy of Public Administration that was developed by use of a committee created by that academy under an agreement with an agency, unless—

(1) the committee was not subject to any actual management or control by an agency or an officer of the Federal Government;

(2) in the case of a committee created after the date of enactment of the **Federal Advisory Committee Act** Amendments of 1997, the membership of the committee was appointed in accordance with the requirements described in subsection (b)(1); and

(3) in developing the advice or recommendation, the academy complied with—

(A) subsection (b)(2) through (6), in the case of any advice or recommendation provided by the National Academy of Sciences; or

(B) subsection (b)(2) and (5), in the case of any advice or recommendation provided by the National Academy of Public Administration.

(b) REQUIREMENTS—The requirements referred to in subsection (a) are as follows:

(1) The Academy shall determine and provide public notice of the names and brief biographies of individuals that the Academy appoints or intends to appoint to serve on the committee. The Academy shall determine and provide a reasonable opportunity for the public to comment on such appointments before they are made or, if the Academy determines such prior comment is not practicable, in the period immediately following the appointments. The Academy shall make its best efforts to ensure that (A) no individual appointed to serve on the committee has a conflict of interest that is relevant to the functions to be performed, unless such conflict is promptly and publicly disclosed and the Academy determines that the conflict is unavoidable, (B) the committee membership is fairly balanced as determined by the Academy to be appropriate for the functions to be performed, and (C) the final report of the Academy will be the result of the Academy's independent judgment. The Academy shall require that individuals that the Academy appoints or intends to appoint to serve on the committee inform the Academy of the individual's conflicts of interest that are relevant to the functions to be performed.

(2) The Academy shall determine and provide public notice of committee meetings that will be open to the public.

(3) The Academy shall ensure that meetings of the committee to gather data from individuals who are not officials, agents, or employees of the Academy are open to the public, unless the Academy determines that a meeting would disclose matters described in section 552(b) of title 5, United States Code. The Academy shall make available to the public, at reasonable charge if appropriate, written materials presented to the committee by individuals who are not officials, agents, or employees of the Academy, unless the Academy determines that making material available would disclose matters described in that section.

(4) The Academy shall make available to the public as soon as practicable, at reasonable charge if appropriate, a brief summary of any committee meeting that is not a data gathering meeting, unless the Academy determines that the summary would disclose matters described in section 552(b) of title 5, United States Code. The summary shall identify the committee members present, the topics discussed, materials made available to the committee, and such other matters that the Academy determines should be included.

(5) The Academy shall make available to the public its final report, at reasonable charge if appropriate, unless the Academy determines that the report would disclose matters described in section 552(b) of title 5, United States Code. If the Academy determines that the report would disclose matters described in that section, the Academy shall make public an abbreviated version of the report that does not disclose those matters.

(6) After publication of the final report, the Academy shall make publicly available the names of the principal reviewers who reviewed the report in draft form and who are not officials, agents, or employees of the Academy.

(c) REGULATIONS—The Administrator of General Services may issue regulations implementing this section.

Note on Prior Provisions: A prior section 15 of the *Federal Advisory Committee Act* was renumbered section 16 by Pub. L. 105–153.

Accompanying Legislative Report

Section 3 of Pub. L. 105–153 provided that: "Not later than one year after the date of the enactment of this Act [Dec. 17, 1997], the Administrator of General Services shall submit a report to the Congress on the implementation of and compliance with the amendments made by this Act [enacting this section, amending section 3 of Pub. L. 92–463, set out in this Appendix, and redesignating former section 15 of Pub. L. 92–463, set out in this Appendix, as section 16]."

○