OFFICE OF TECHNOLOGY ASSESSMENT

CONGRESS OF THE UNITED STATES

# THE OTA LEGACY

The Congressional Office of Technology Assessment closed on September 29, 1995. During its 23-year history, OTA provided Congressional members and committees with analysis of the scientific and technological issues that are increasingly relevant to public policy and legislative action.

OTA occupied a unique role among the Congressional information agencies. Unlike the General Accounting Office, which is primarily concerned with evaluation of ongoing programs, and the Congressional Research Service, which provides rapid information on legislative topics, OTA provided a deeper, more comprehensive, and more technical level of analysis. Through eleven Congressional sessions, OTA became a key resource for Congressional members and staff confronting technological issues in crafting public policy. Its existence brought a healthy balance to the analytical resources available to the executive and legislative branches of government.

The agency's legacy is found in the many items of legislation it influenced and in the channels of communication its staff helped foster between legisla-

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OFFICE OF TECHNOLOGY ASSESSMENT

CONGRESS OF THE UNITED STATES

# THE OTA LEGACY

tive policymakers and members of the scientific, technical, and business communities. The Office's legacy is also found in its hundreds of publications, gathered for the first time in electronic form on this set of CD-ROMs: *The OTA Legacy, 1972-1995*.

These disks contain all the formally issued reports of the Office of Technology Assessment, as well as many background papers and contractor papers—over 100,000 pages of the best available analyses of the scientific and technical policy issues of the past two decades. In addition, the disks contain supplemental historical materials that illuminate the history and impact of the agency, which has been widely imitated internationally by governments interested in wise and informed stewardship of the public trust on issues with technical complexity. The OTA reports collected here are widely acknowledged to be nonpartisan, objective, and thorough. In many cases, they have also proven to be of enduring interest and relevance. By publishing its written legacy in electronic form, the Office of Technology Assessment hopes to preserve the investment made in its work for future users.

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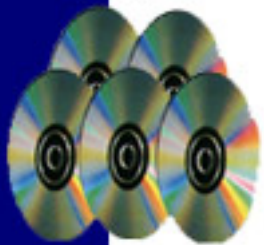
Office of Technology Assessment

# The OTA Legacy





## Technology Assessment and the Work of Congress

A history of the Office of Technology Assessment

## OTA Publications

An electronic archive of the Office of Technology Assessment

## About This Disk...

How to find information using the navigation ellipse and the full-text search tools.



OFFICE OF TECHNOLOGY ASSESSMENT

# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

The links that follow lead to explanations of the structure and function of the Office of Technology Asssessment and to articles and press accounts that discuss the historical and political context in which it operated.

## *History and Function of OTA*

- **The Assessment Process**

- **The Technology Assessment Act**
  *October 13, 1972*

- **Technology Assessment**
  **Current Trends and the Myth of a Formula**
  *Peter D. Blair*
  *Assistant Director, Office of Technology Assessment*
  *May 2, 1994*

***Cont'd…***

OFFICE OF TECHNOLOGY ASSESSMENT

# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

- **New Challenge or the Past Revisited?**
  **The Office of Technology Assessment in Historical Context**
  *Gregory C. Kunkle*
  *Technology in Society, Vol. 17, No. 2, pp. 175-196, 1995*

## *The End of OTA*

- **Remarks of Roger Herdman, OTA Director**
  *September 29, 1995*

- **In Memoriam: The Office of Technology Assessment, 1972-1995**
  *Hon. Amo Houghton*
  *Congressional Record, September 28, 1995*

***Cont'd…***

# Technology Assessment and the Work of Congress

## *Press Coverage*

- **Technology Assessment No Longer Theoretical**
  *James H. Krieger*
  *Chemical & Engineering News—April 6, 1970*

- **The Debate Over Assessing Technology**
  *Business Week—April 6, 1972*

- **OTA Caught in Partisan Crossfire**
  *Colin Norman*
  *Technology Review—October/November 1977*

- **Little-Known Agency Draws Worldwide Interest**
  *David Burnham*
  *New York Times—January 12, 1984*

***Cont'd…***

OFFICE OF TECHNOLOGY ASSESSMENT

# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

- **OTA Emerges as Nonpartisan Player**
  *Barton Reppert*
  *Associated Press/Washington Post—January 5, 1988*

- **Death by Congressional Ignorance**
  *M. Granger Morgan*
  *Pittsburgh Post-Gazette—August 2, 1995*

- **Congress's Science Agency Prepares To Close Its Doors**
  *Warren E. Leary*
  *New York Times—September 24, 1995*



# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

## 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 Board 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,

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# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

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 Board reviewed all major studies prior to release. The path below illustrates the major steps in the assessment process:

**Pre-request activity**
Conversations with committee members and staff

↓

**Formal Request**

↓

**Proposal**

↓

**TAB Approval**

↓

*Cont'd…*

# Technology Assessment and the Work of Congress

**Selection of advisory panel**
Data collection and analysis
Advisory panel meetings
Contractor reports
Briefings
Surveys, site visits, workshops

↓

**Draft final report**
Staff drafts report

↓

**Draft final report**
Staff drafts report
Internal & external review
Revision & transmission to Director and TAB for approval

↓



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OFFICE OF TECHNOLOGY ASSESSMENT

# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

**Release summary & full report**
Embargoed press packet
Press conference
Mailings to Congress, study participants, libraries, interested parties
Electronic dissemination

↓

**Report coverage**
Science press
Popular press, radio, TV
Professional associations
Information services

↓

**Policy action**
Congressional hearings
Staff briefing & talks
Legislative action
Interaction with Executive Branch

*Cont'd…*

# Technology Assessment and the Work of Congress

The research and writing of the assessments were 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 at the close of the agency, 58% with Ph.D.'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

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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 a 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

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# Technology Assessment and the Work of Congress

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

***Cont'd…***

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 exam-

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ined 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.



# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

At the close of the agency, the Technology Assessment Board of the 103rd Congress included the following members:*

**EDWARD M. KENNEDY**, Massachusetts, *Chairman*
**DON SUNDQUIST**, Tennessee, *Vice Chairman*

| SENATE | HOUSE |
|---|---|
| ERNEST F. HOLLINGS, South Carolina | GEORGE E. BROWN, JR. California |
| CLAIBORNE PELL, Rhode Island | JOHN D. DINGELL, Michigan |
| ORRIN G. HATCH, Utah | JIM McDERMOTT, Washington |
| CHARLES E. GRASSLEY, Iowa | AMO HOUGHTON, New York |
| DAVE DURENBERGER, Minnesota | MICHAEL G. OXLEY, Ohio |

ROGER C. HERDMAN
(Nonvoting)

*The TAB for the 104th Congress had not yet been appointed.

# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

At the close of the agency, the Technology Assessment Advisory Council included the following members:

JAMES C. HUNT, *Chairman*
Distinguished Professor,
Health Sciences Center
University of Tennessee
Memphis, Tennessee

MAX LENNON, *Vice Chairman*
President and CEO
Eastern Foods, Inc.
Atlanta, Georgia

CHARLES A. BOWSHER
Comptroller General of the United States
Washington, D.C.

LEWIS M. BRANSCOMB
Director
Science, Technology, & Public Policy
Program, Harvard University
Cambridge, Massachusetts

HERBERT (TED) DOAN
President (Ret.)
The Dow Chemical Company
Midland, Michigan

NEIL E. HARL
Charles F. Curtiss Distinguished Professor
Iowa State University
Ames, Iowa

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OFFICE OF TECHNOLOGY ASSESSMENT

# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS


JOSHUA LEDERBERG
Professor
Rockefeller University
New York, New York

DANIEL MULHOLLAN
Director, Congressional Research Service
The Library of Congress
Washington, D.C.

THOMAS J. PERKINS
General Partner
Kleiner, Perkins, Caufield and Byers
San Francisco, California

JOHN F.M. SIMS
Vice President, Marketing
Usibelli Coal Mine, Inc.
Fairbanks, Alaska

L. DOUGLAS SMOOT
Dean, College of Engineering
and Technology
Brigham Young University
Salt Lake City, Utah

MARINA v.N. WHITMAN
Professor, Institute of Public Policy Studies
University of Michigan
Ann Arbor, Michigan




# The Technology Assessment Act of 1972

*Public Law 92-484*
*92d Congress, H.R. 10243*
*October 13, 1972*

**An Act**

To establish an Office of Technology Assessment for the Congress as an aid in the identification and consideration of existing and probable impacts of technological application; to amend the National Science Foundation Act of 1950; and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the Technology Assessment Act of 1972.

**FINDINGS AND DECLARATION OF PURPOSE**

SEC. 2. The Congress hereby finds and declares that:

(a) As technology continues to change and expand rapidly, its applications are—

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# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

1. large and growing in scale; and
2. increasingly extensive, pervasive, and critical in their impact, beneficial and adverse, on the natural and social environment.

(b) Therefore, it is essential that, to the fullest extent possible, the consequences of technological applications be anticipated, understood, and considered in determination of public policy on existing and emerging national problems.

(c) The Congress further finds that:

1. the Federal agencies presently responsible directly to the Congress are not designed to provide the legislative branch with adequate and timely information, independently developed, relating to the potential impact of technological applications, and
2. the present mechanisms of the Congress do not and are not designed to provide the legislative branch with such information.

(d) Accordingly, it is necessary for the Congress to—

1. equip itself with new and effective means for securing competent, unbiased information concerning the physical, biological, economic, social, and political effects of such

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applications; and

2. utilize this information, whenever appropriate, as one factor in the legislative assessment of matters pending before the Congress, particularly in those instances where the Federal Government may be called upon to consider support for, or management or regulation of, technological applications.

**ESTABLISHMENT OF THE OFFICE OF TECHNOLOGY ASSESSMENT**

SEC. 3. (a) In accordance with the findings and declaration of purpose in section 2, there is hereby created the Office of Technology Assessment (hereinafter referred to as the Office) which shall be within and responsible to the legislative branch of the Government.

(b) The Office shall consist of a Technology Assessment Board (hereinafter referred to as the Board) which shall formulate and promulgate the policies of the Office, and a Director who shall carry out such policies and administer the operations of the Office.

(c) The basic function of the Office shall be to provide early indications of the probable beneficial and adverse impacts of the applications of technology and to develop other

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# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

coordinate information which may assist the Congress. In carrying out such function, the Office shall:

1. identify existing or probable impacts of technology or technological programs;
2. where possible, ascertain cause-and-effect relationships;
3. identify alternative technological methods of implementing specific programs;
4. identify alternative programs for achieving requisite goals;
5. make estimates and comparisons of the impacts of alternative methods and programs;
6. present findings of completed analyses to the appropriate legislative authorities;
7. identify areas where additional research or data collection is required to provide adequate support for the assessments and estimates described in paragraph (1) through (5) of this subsection; and
8. undertake such additional associated activities as the appropriate authorities specified under subsection (d) may direct.

(d) Assessment activities undertaken by the Office may be initiated upon the request of:

1. the chairman of any standing, special, or select committee of either House of the Congress, or of any joint committee of the Congress, acting for himself or at the

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request of the ranking minority member or a majority of the committee members;
2. the Board; or
3. the Director, in consultation with the Board.

(e) Assessments made by the Office, including information, surveys, studies, reports, and findings related thereto, shall be made available to the initiating committee or other appropriate committees of the Congress. In addition, any such information, surveys, studies, reports, and findings produced by the Office may be made available to the public except where

1. to do so would violate security statutes; or
2. the Board considers it necessary or advisable to withhold such information in accordance with one or more of the numbered paragraphs in section 552(b) of title 5, United States Code.

**TECHNOLOGY ASSESSMENT BOARD**

SEC. 4. (a) The Board shall consist of thirteen members as follows:

1. six Members of the Senate, appointed by the President pro tempore of the Senate, three from the majority party and three from the minority party;

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2. six Members of the House of Representatives appointed by the Speaker of the House of Representatives, three from the majority party and three from the minority party; and
3. the Director, who shall not be a voting member.

(b) Vacancies in the membership of the Board shall not affect the power of the remaining members to execute the functions of the Board and shall be filled in the same manner as in the case of the original appointment.

(c) The Board shall select a chairman and a vice chairman from among its members at the beginning of each Congress. The vice chairman shall act in the place and stead of the chairman in the absence of the chairman. The chairmanship and the vice chairmanship shall alternate between the Senate and the House of Representatives with each Congress. The chairman during each even-numbered Congress shall be selected by the Members of the House of Representatives on the Board from among their number. The vice chairman during each Congress shall be chosen in the same manner from that House of Congress other than the House of Congress of which the chairman is a Member.

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(d) The Board is authorized to sit and act at such places and times during the sessions, recesses, and adjourned periods of Congress, and upon a vote of a majority of its members, to require by subpoena or otherwise the attendance of such witnesses and the production of such books, papers, and documents, to administer such oaths and affirmations, to take such testimony, to procure such printing and binding, and to make such expenditures, as it deems advisable. The Board may make such rules respecting its organization and procedures as it deems necessary, except that no recommendation shall be reported from the Board unless a majority of the Board assent. Subpoenas may be issued over the signature of the chairman of the Board or of any voting member designated by him or by the Board, and may be served by such person or persons as may be designated by such chairman or member. The chairman of the Board or any voting member thereof may administer oaths or affirmations to witnesses.

**DIRECTOR AND DEPUTY DIRECTOR**

SEC. 5. (a) The Director of the Office of Technology Assessment shall be appointed by the Board and shall serve for a term of six years unless sooner removed by the Board. He shall receive basic pay at the rate provided for level III of the Executive Schedule under section 5314 of title 5, United States Code.

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(b) In addition to the powers and duties vested in him by this Act, the Director shall exercise such powers and duties as may be delegated to him by the Board.

(c) The Director may appoint with the approval of the Board, a Deputy Director who shall perform such functions as the Director may prescribe and who shall be Acting Director during the absence or incapacity of the Director or in the event of a vacancy in the office of Director. The Deputy Director shall receive basic pay at the rate provided for level IV of the Executive Schedule under section 5315 of title 5, United States Code.

(d) Neither the Director nor the Deputy Director shall engage in any other business, vocation, or employment than that of serving as such Director or Deputy Director, as the case may be; nor shall the Director or Deputy Director, except with the approval of the Board, hold any office in, or act in any capacity for, any organization, agency, or institution with which the Office makes any contract or other arrangement under this Act.

**AUTHORITY OF THE OFFICE**

SEC. 6. (a) The Office shall have the authority, within the limits of available appropriations, to do all things necessary to carry out the provisions of this Act, including, but

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# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

without being limited to, the authority to

1. make full use of competent personnel and organizations outside the Office, public or private, and form special ad hoc task forces or make other arrangements when appropriate;
2. enter into contracts or other arrangements as may be necessary for the conduct of the work of the Office with any agency or instrumentality of the United States, with any State, territory, or possession or any political subdivision thereof, or with any person, firm, association, corporation, or educational institution, with or without reimbursement, without performance or other bonds, and without regard to section 3709 of the Revised Statutes (41 U.S.C. 5);
3. make advance, progress, and other payments which relate to technology assessment without regard to the provisions of section 3648 of the Revised Statutes (31 U.S.C. 529);
4. accept and utilize the services of voluntary and uncompensated personnel necessary for the conduct of the work of the Office and provide transportation and subsistence as authorized by section 5703 of title 5, United States Code, for persons serving without compensation;
5. acquire by purchase, lease, loan, or gift, and hold and dispose of by sale, lease, or

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loan, real and personal property of all kinds necessary for or resulting from the exercise of authority granted by this Act; and

6. prescribe such rules and regulations as it deems necessary governing the operation and organization of the Office.

(b) Contractors and other parties entering into contracts and other arrangements under this section which involve costs to the Government shall maintain such books and related records as will facilitate an effective audit in such detail and in such manner as shall be prescribed by the Office, and such books and records (and related documents and papers) shall be available to the Office and the Comptroller General of the United States, or any of their duly authorized representatives, for the purpose of audit and examination.

(c) The Office, in carrying out the provisions of this Act, shall not, itself, operate any laboratories, pilot plants, or test facilities.

(d) The Office is authorized to secure directly from any executive department or agency information, suggestions, estimates, statistics, and technical assistance for the purpose of carrying out its functions under this Act. Each such executive department or agency shall

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furnish the information, suggestions, estimates, statistics, and technical assistance directly to the Office upon its request.

(e) On request of the Office, the head of any executive department or agency may detail, with or without reimbursement, any of its personnel to assist the Office in carrying out its functions under this Act.

(f) The Director shall, in accordance with such policies as the Board shall prescribe, appoint and fix the compensation of such personnel as may be necessary to carry out the provisions of this Act.

**ESTABLISHMENT OF THE TECHNOLOGY ASSESSMENT ADVISORY COUNCIL**

SEC. 7. (a) The Office shall establish a Technology Assessment Advisory Council (hereinafter referred to as the Council). The Council shall be composed of the following twelve members:

1. ten members from the public, to be appointed by the Board, who shall be persons eminent in one or more fields of the physical, biological, or social sciences or engineer-

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ing or experienced in the administration of technological activities, or who may be judged qualified on the basis of contributions made to educational or public activities;
2. the Comptroller General; and
3. the Director of the Congressional Research Service of the Library of Congress.

(b) The Council, upon request by the Board, shall—
1. review and make recommendations to the Board on activities undertaken by the Office or on the initiation thereof in accordance with section 3(d);
2. review and make recommendations to the Board on the findings of any assessment made by or for the Office; and
3. undertake such additional related tasks as the Board may direct.

(c) The Council, by majority vote, shall elect from its members appointed under subsection (a)(1) of this section a Chairman and a Vice Chairman, who shall serve for such time and under such conditions as the Council may prescribe. In the absence of the Chairman, or in the event of his incapacity, the Vice Chairman shall act as Chairman.

(d) The term of office of each member of the Council appointed under subsection (a)(1)

*Cont'd…*

shall be four years except that any such member appointed to fill a vacancy occurring prior to the expiration of the term for which his predecessor was appointed shall be appointed for the remainder of such term. No person shall be appointed a member of the Council under subsection (a)(1) more than twice. Terms of the members appointed under subsection (a)(1) shall be staggered so as to establish a rotating membership according to such method as the Board may devise.

(e)

1. The members of the Council other than those appointed under subsection (a)(1) shall receive no pay for their services as members of the Council, but shall be allowed necessary travel expenses (or, in the alternative, mileage for use of privately owned vehicles and per diem in lieu of subsistence at not to exceed the rate prescribed in sections 5702 and 5704 of title 5, United States Code), and other necessary expenses incurred by them in the performance of duties vested in the Council, without regard to the provisions of subchapter 1 of chapter 57 and section 5731 of title 5, United States Code, and regulations promulgated thereunder.
2. The members of the Council appointed under subsection (a)(1) shall receive compensation for each day engaged in the actual performance of duties vested in the

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Council at rates of pay not in excess of the daily equivalent of the highest rate of basic pay set forth in the General Schedule of section 5332(a) of title 5, United States Code, and in addition shall be reimbursed for travel, subsistence, and other necessary expenses in the manner provided for other members of the Council under paragraph (1) of this subsection.

**UTILIZATION OF THE LIBRARY OF CONGRESS**

SEC. 8. (a) To carry out the objectives of this Act, the Librarian of Congress is authorized to make available to the Office such services and assistance of the Congressional Research Service as may be appropriate and feasible.

(b) Such services and assistance made available to the Office shall include, but not be limited to, all of the services and assistance which the Congressional Research Service is otherwise authorized to provide to the Congress.

(c) Nothing in this section shall alter or modify any services or responsibilities, other than those performed for the Office, which the Congressional Research Service under law performs for or on behalf of the Congress. The Librarian is, however, authorized to

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establish within the Congressional Research Service such additional divisions, groups, or other organizational entities as may be necessary to carry out the purpose of this Act.

(d) Services and assistance made available to the Office by the Congressional Research Service in accordance with this section may be provided with or without reimbursement from funds of the Office, as agreed upon by the Board and the Librarian of Congress.

**UTILIZATION OF THE GENERAL ACCOUNTING OFFICE**

SEC. 9. (a) Financial and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) and such other services as may be appropriate shall be provided the Office by the General Accounting Office.

(b) Such services and assistance to the Office shall include, but not be limited to, all of the services and assistance which the General Accounting Office is otherwise authorized to provide to the Congress.

(c) Nothing in this section shall alter or modify any services or responsibilities, other than those performed for the Office, which the General Accounting Office under law performs

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for or on behalf of the Congress.

(d) Services and assistance made available to the Office by the General Accounting Office in accordance with this section may be provided with or without reimbursement from funds of the Office, as agreed upon by the Board and the Comptroller General.

**COORDINATION WITH THE NATIONAL SCIENCE FOUNDATION**

SEC. 10. (a) The Office shall maintain a continuing liaison with the National Science Foundation with respect to—

1. grants and contracts formulated or activated by the Foundation which are for purposes of technology assessment; and
2. the promotion of coordination in areas of technology assessment, and the avoidance of unnecessary duplication or overlapping of research activities in the development of technology assessment techniques and programs.

(b) Section 3(b) of the National Science Foundation Act of 1950, as amended (42 U.S.C. 1862(b)), is amended to read as follows:

"(b) The Foundation is authorized to initiate and support specific scientific activities in

*Cont'd…*

connection with matters relating to international cooperation, national security, and the effects of scientific applications upon society by making contracts or other arrangements (including grants, loans, and other forms of assistance) for the conduct of such activities. When initiated or supported pursuant to requests made by any other Federal department or agency, including the Office of Technology Assessment, such activities shall be financed whenever feasible from funds transferred to the Foundation by the requesting official as provided in section 14(g), and any such activities shall be unclassified and shall be identified by the Foundation as being undertaken at the request of the appropriate official."

**ANNUAL REPORT**

SEC. 11. The Office shall submit to the Congress an annual report which shall include, but not be limited to, an evaluation of technology assessment techniques and identification, insofar as may be feasible, of technological areas and programs requiring future analysis. Such report shall be submitted not later than March 15 of each year.

**APPROPRIATIONS**

SEC. 12. (a) To enable the Office to carry out its powers and duties, there is hereby

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authorized to be appropriated to the Office, out of any money in the Treasury not otherwise appropriated, not to exceed $5,000,000 in the aggregate for the two fiscal years ending June 30, 1973, and June 30, 1974, and thereafter such sums as may be necessary.

(b) Appropriations made pursuant to the authority provided in subsection (a) shall remain available for obligation, for expenditure, or for obligation and expenditure for such period or periods as may be specified in the Act making such appropriations.

Approved October 13, 1972.

**LEGISLATIVE HISTORY**

**HOUSE REPORTS**
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**SENATE REPORT**
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**CONGRESSIONAL RECORD**

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# Technology Assessment

***Current Trends and the Myth of a Formula***

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*adapted from plenary remarks at the First Meeting of the International Association of Technology Assessment and Forecasting Institutions*
*May 2, 1994*
*Bergen, Norway*

> *"As new discoveries are made, new truths discovered, and manners and opinions change with the change of circumstances, institutions must advance also to keep pace with the times."*
>
> *Thomas Jefferson*

Enormous changes around the world—the fall of the Berlin Wall, the truly historic changes in South Africa, the economic emergence of the Pacific rim, and the globalization of the world economy—have proven the wisdom of Jefferson's insistence on main-

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taining flexibility in institutions of public governance. But in addition to constant economic and political change, governments and public institutions are challenged by the rapid evolution of science and technology and all the effects that flow from that evolution. Jefferson—a technologist—would agree that an ability to share experiences and to better gauge the impacts of technology on societies around the world are essential to our future.

For the first two decades of the Office of Technology Assessment's existence, its activities have often been referred to as a kind of experiment for trying to incorporate a better understanding of technology and science into the legislative policy process. One result of that experiment is the emergence of a consensus that it is impossible to reduce technology assessment to a formula. At OTA, there are many variations in the methods and approaches used in the work, and the agency's approach is, to be sure, but one variation of how technology assessment is viewed in different institutional settings. OTA doesn't have everything right in the process of technology assessment—no one does, and those that suggest the contrary should consider the advice of Will Rogers: "What gets us into trouble isn't so much what we don't know, it's what we know for sure that just ain't so." Nonetheless, many lessons have been learned over the years.

The OTA was created in 1972 by the U.S. Congress to "provide early indications of the probable beneficial and adverse impacts of the applications of technology." This original

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mandate has evolved somewhat over time: the agency is now regarded as fulfilling a more general role of providing congressional committees, which are the key policy formulating vehicles in the Congress, with objective analysis of public policy issues related to scientific and technological change. This new mandate actually incorporates the original mandate, but it is much broader and more problem-oriented, and in practice the agency's activities are almost totally determined by the committees of Congress. The transformation of the agency's mandate came about due to a mixture of pragmatism and of priorities in Congressional activities, but this transformation explains the way the agency operates today.

## *The Office of Technology Assessment: A Congressional Innovation*

The efforts to create an institution in the U.S. like OTA began in the mid-1960s when Congressman Emilio Daddario, then Chairman of the Subcommittee on Science, Research and Development in the House of Representatives, introduced legislation to establish a Technology Assessment Board—much like a committee of Congress. After much heated debate in the House over several Congressional sessions, a new version of the bill was introduced seeking to create a new technology assessment agency in the Legislative branch of government. Many outside the United States don't appreciate the significance

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of such an action. In the United States, executive branch government agencies are created and retired quite frequently—at present we have hundreds. But in the legislative branch—a branch separate but equal to the executive branch—agency creations are very rare. In fact, at the time of OTA's beginning there had been no such additions since the creation of the General Accounting Office in 1921, over 50 years earlier. Moreover, to date there are only four such agencies: OTA, GAO, the Congressional Budget Office (CBO), and the Congressional Research Service (CRS).

The legislative initiative that created OTA actually started as a fairly modest proposal to provide Congress with a better analytical perspective on technology-related policy, but it ended up being successful politically through a fascinating coalition of interests in Congress that actually had very different objectives.

First, there was the small cadre of legislators with a vision about technology assessment and its role in the legislative process.

Second, there were many in Congress who sought to react institutionally to the then recent creations of executive agencies such the Office of Management and Budget and the Office of Science and Technology Policy in the White House. Indeed, in 1972 many viewed the creation of OTA, as well as the creation of the Congressional Budget Office (CBO) two years later, as part of a Congressional reassertion of authority following the

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Nixon presidency. In a twist of interesting irony that seems consistent with the agency's bipartisan perspective, OTA's longest-serving director, Jack Gibbons, went to the White House in 1992 to head the Office of Science and Technology Policy for a Democratic president, having served in the Republican Nixon White House in 1972.

Finally, another important element of the context at the time of OTA's creation was that a number of major policy issues arose during the Nixon presidency that had very technical dimensions to them, such as the U.S. investment in supersonic transport (SST), the antiballistic missile system , and the Trans-Alaska pipeline. With such issues, many in Congress felt they were at a considerable disadvantage in dealing with the Executive branch, which had the established agencies to draw upon as resources along with these newly created entities.

As Senator Edward Kennedy put it in the debates considering the legislation that led to OTA's creation, "without an OTA the role of Congress in national science policy would become more and more perfunctory and more and more dependent on administration facts and figures, with little opportunity for independent Congressional evaluation."

That argument and the political coalition just described led to the passage in both houses of Congress of the Technology Assessment Act of 1972, OTA's enabling statute. Funds were appropriated for OTA's operations in 1973 and the agency began operations

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in 1974 with a handful of staff which has grown to over 200 today along with a portfolio of activities that spans the entire Congress. Actually, OTA's staff is composed of a core permanent staff of 143 that is supplemented with temporary staff recruited to meet the needs of current assessments. Both permanent and temporary staff include professionals from many disciplines, over half with Ph.D.s.

The key organizational elements created in OTA's enabling statute are the Technology Assessment Board, known as TAB, composed of members of the House and Senate; the Technology Assessment Advisory Council (TAAC), composed primarily of private citizens appointed by TAB; and the Office of the Director, which oversees day-to-day operations of the agency.

## *Technology Assessment Board (TAB)*

The Technology Assessment Board is the central organizational element of OTA's enabling statute. Its composition is unique among the legislative support agencies. TAB is a 12-member governing board of OTA, with six members of the Senate and six of the House, divided equally between the political parties. The principal responsibilities of TAB are to appoint the Director, to authorize the initiation of assessments requested by Congressional Committees, to approve the budget authority associated with those assess-

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ments, 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—that is, that OTA has considered all the relevant stakeholder interests and issues and undergone extensive external review. OTA receives an annual appropriation from Congress that is allocated to OTA's support operations and among OTA active projects as authorized by TAB.

In the early days of the agency, 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. In fact, neither has occurred. Board members are appointed by the leadership in both the House and the Senate and include some of the most powerful members of Congress. The board meets approximately every six weeks when Congress is in session and usually exhibits a strong turnout with disagreements seldom reflecting party or ideological lines.

One incident illustrates the effective functioning of the Technology Assessment Board. A TAB member voted in the board meeting to authorize the release of a somewhat controversial study on the 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 policy options identified in the report's conclusions. Some felt that

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this was inconsistent and perhaps 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 identified policy options affect his position on the overall perspective of the report. At the same time he honored the political interests of his constituents by disagreeing with those options that were not in their interests.

In the early days of the agency TAB played a much stronger role in appointing staff and exerting more direct involvement in assessments, but TAB recognized in the late 1970s that in order for the agency to carry out objective analysis, the day-to-day operation, including especially appointment of project staff and advisory panelists, had to be separated from the members' offices. This facet of OTA's operations has been crucial to its reputation for objectivity over the years, and one that those planning or developing government-sponsored technology assessment institutions should consider carefully.

### *Technology Assessment Advisory Council (TAAC)*

The Technology Assessment Advisory Council is essentially OTA's outside visiting committee. It is appointed by TAB and meets every six months to review the overall direction of the agency and to periodically carry out more detailed reviews of the agency's research programs.

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## *Office of the Director*

The Director is responsible for day-to-day operations, hiring of staff, interaction with TAB and TAAC, and strategic planning for the agency. OTA has had four directors: Daddario, who was essentially the founding inspiration for the agency; Russell Peterson who, while serving only a year, effected important institutional changes, especially in separating OTA staff from Members' staffs and in strategically planning the agency's agenda; Jack Gibbons, who during the late 1970s and 1980s presided over 13 years of growth of the agency—both in size and in reputation; and the current director, Roger Herdman, who assumed the helm in 1993 and has been successful in building the agency's strengths and relationships to the legislative process.

## *OTA's Process of Technology Assessment*

Generally OTA undertakes assessments at the request of the Chairs of Congressional Committees. Typically, an OTA assessment takes 18-24 months to complete and costs on the order of $500,000 in direct costs (although indirect costs are often substantial). The assessments seldom offer specific recommendations. Rather, they articulate the options and the consequences of alternative options.

A great deal of effort goes into defining the scope of an assessment once it has been

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requested by a Committee Chair. Since the agency frequently has many more requests than it can accommodate, the directors often consult with other Committees of jurisdiction and interest as well as with the TAB board informally to help establish priorities fairly. Once the scope is established, a proposal is prepared for formal consideration by the board and, if approved, the assessment commences.

Currently the agency is addressing a broad range of assessments from energy and environmental technology transfer to eastern Europe, to proliferation of weapons of mass destruction, to global telecommunications policy, to biological pest control, to health care reform. The key elements of an assessment newly underway typically are:

- a comprehensive advisory panel of technical experts and relevant stakeholders;
- a core OTA project team including an experienced project director;
- contractors selected to support major analytical tasks;
- in-house research efforts by the project team;
- workshops convened with additional experts and stakeholders to obtain the

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most current information possible;

- extensive peer review of draft reports;
- and finally, delivery of reports through congressional hearings, briefings, and public release;

The advisory panels are a particularly important feature of OTA's process. They help refine the project scope, identify additional relevant resources and perspectives on the issues being addressed, and provide the core of extensive peer review. The panel is central, but OTA takes responsibility for the final product. It does 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 is a report, along with summaries, report briefs, personal briefings for members and committees, commercial publishers' reprints, and most recently electronic delivery over the Internet and Capitol Hill's own local area network.

The process briefly outlined here has worked well for OTA as it has evolved over the years in the organizational framework of the U.S. Congress, and many aspects of it may be valuable in other institutional settings. In particular, OTA has some unique features

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that make it valuable to the Congress's policy process: it is governed by a bipartisan board of politicians that respect the agency's position and perspective; it has a statutory advisory council that reports to that board; it has a multidisciplinary staff that helps minimize ideological and/or methodological bias in analysis; and it draws on outside resources for the bulk of its analysis—it often serves as translator of the technical literature. There is often more heat than light shed when policy mixes with technology, and simply explaining the context of a problem clearly can be of enormous benefit—as in the case when President Eisenhower was stunned to find that half of the U.S. population was of below average intelligence. Finally, OTA's process includes extensive outside peer review, including often as many as a hundred reviewers from many different perspectives.

In summary, Jefferson eloquently pointed out the necessity of government's ability to change with the times. That thought was visionary but it lacked an orderly way of identifying the implications of the technology dimension of those changing times. The Office of Technology Assessment and other international organizations dedicated to developing the art of technology assessment and forecasting may help fill that gap.



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# New Challenge or the Past Revisited?

***The Office of Technology Assessment in Historical Context***

*Gregory C. Kunkle*
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ABSTRACT: Recent opposition to the Office of Technology Assessment (OTA) revives concerns raised when this office was first proposed. Then, as now, members of Congress were concerned that the OTA might duplicate functions of other agencies. Although the original concept of technology assessment came out of a desire to better control negative technological impacts on the environment, the most important factor in establishing the OTA was a desire on the part of Congress for technical advice independent of the executive branch. Accordingly, Congress has retained rather tight control, making the OTA more of an information agency that responds to congressional requests than an independent early-warning or technology-monitoring mechanism. As a review of its historical development can indicate, further limitations imposed on the

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agency would undermine the last vestiges the original assessment concept, whereas eliminating the office would have implications for future executive-legislative relations.

As part of the larger aims outlined in their *Contract With America*, Republican leaders have announced their intention to eliminate the Congressional Office of Technology Assessment (OTA). In order to reduce expenditures and streamline the federal government, the Senate Republican Policy Committee has favored eliminating the office, arguing that "a lot of [its] duties could probably be picked up by the Congressional Research Service."[2] But this threat is not new, and the issues presented by current OTA critics are strikingly similar to concerns voiced in the late 1960s and early 1970s, when it was first being proposed. Responses to the early concerns have been crucial to the office's subsequent history and even limit the ways in which it can now respond to the same charges raised anew.

## *Origins of the OTA*

The OTA was established by an act of Congress and signed into law by President Nixon in October 1972, but its history has deeper roots. The idea for the organization emerged in

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a period of technological revisionism characterized by the Supersonic Transport (SST) and Anti-Ballistic Missile (ABM) controversies and the closely related burgeoning environmental concerns of the 1960s and 1970s. While the office is often discussed in that context, its origins are also deeply enmeshed in tensions between the executive and legislative branches of the Federal government. In response to the problem of managing an increasing science and technology budget and the attendant difficulties of legislative oversight of scientific and technically ensconced executive agencies, members of Congress began calling for better technical advice in the early 1960s.

By 1962, Congress had begun to take action to improve the information it received by enacting statutory changes in the Office of Science and Technology in the Executive Office of the president to make the president's science adviser more accessible to the Congress. But the feeling persisted that Congress needed more and better advice. This perception became especially acute in the House Committee on Science and Astronautics—a committee whose tasks had increased considerably in significance and scope with President Kennedy's pledge on May 25, 1961, to land a man on the moon by the decade's end. The committee chairman, California Democrat George Miller, expressed his concern over Congress's lack of ability to evaluate matters of scientific and technical complexity. In what would become a recurring theme during the 1960s, Miller remarked:

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> We are concerned with whether or not hasty decisions are handed down to us, but one of our difficulties is how to evaluate these decisions. We have to take a great deal on faith. We are not scientists…[but] I want to say that in our system of government we have our responsibility. We are not the rubber stamps of the administrative branch of government…[W]e recognize our responsibility to the people and the necessity for making some independent judgments…[but] we do not particularly have the facilities nor the resources that the executive department of government has.[3]

This concern was shared by members on both sides of the aisle. Miller's remarks were immediately followed by those of Representative James G. Fulton of Pennsylvania, a Republican. Fulton commented on the shortcomings of relying on the Bureau of the Budget, which is part of the executive branch, for information, remarking that "there is a defect…there is no scientific evaluation or judgement put to it, as between programs or the worthiness of a particular program…we do need good advice."[4]

With an eye toward strengthening the Congress's scientific oversight of federal science and technology initiatives and to more "effectively choose and implement research and development policy," the Committee on Science and Astronautics established a subcom-

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mittee on Science, Research, and Development under the chairmanship of Representative Emilio Daddario, Democrat from Connecticut. The new subcommittee was commissioned to determine what kind of advice Congress required "in order to oversee programs effectively and to legislate in a knowledgeable manner" and to investigate "the available sources of science advice to the Congress and how may those be used effectively."[5] To that end, beginning in October 1963, the Daddario subcommittee held hearings at which prominent scientists and government officials testified.

The first person to appear before the subcommittee was Dr. Frederick Seitz, President of the National Academy of Sciences. Daddario's opening remarks indicated the concern felt in Congress regarding the imbalance of technical advice available to the different branches of government. As he remarked to Seitz, "it is obvious that from the very beginning the National Academy of Sciences has had a close relationship with the executive branch, and yet this has not been so with the Congress."[6]

In response to this desire for better advice, as early as 1963, members of Congress introduced legislation directed at strengthening congressional capabilities in science and technology, emphasizing the need to do so in light of the executive branch advantages. Having addressed the Senate in July, 1963, Senator Edward L. Bartlett, Democrat from Alaska, introduced a bill on August 13 to "establish in the legislative branch of the Gov-

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ernment a Congressional Office of Science and Technology." Although the bill was referred to committee and never brought to the floor, Bartlett's comments were illustrative of widespread concern. "The scientific revolution proceeds faster and faster…and the President, in requesting authority for these vast scientific programs undertaken by the Government,…has available to him the fill advice and counsel of the scientific community."

> But Congress has no such help…no source of independent scientific wisdom and advice. Far too often congressional committees for expert advice rely upon the testimony of the very scientists who have conceived the program, the very scientists who will spend the money if the program is authorized and appropriated for.

For Bartlett, the conclusion was that "Congress as a body must equip itself to legislate on technological matters with coherence and comprehension."[8]

Members of Congress also repeatedly pointed to their disadvantage as not being formally trained in the sciences. For instance, the ranking Republican of the Science, Research and Development Subcommittee, Charles Mosher, noted in a 1966 interview, "It's obvious that we are in a different position from the members of most committees [who]

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are dealing with subjects on which the whole human race has had some experience." Indeed, with reference to fellow committee member, Michigan Democrat, Weston Vivian, a PhD scientist, he noted how "Dr. Vivian, with his engineering background, is the exception to the rule; the manner in which he has been able to probe the expert witnesses has been a revelation to me.[9]

This desire to equip the Congress to defend against the executive branch advantages set the Science, Research and Development subcommittee agenda through the mid-1960s. In the initial set of hearings held by the committee, Presidential Science Adviser Jerome Wiesner pointed to the need for Congress to improve its scientific and technical advice capabilities, specifically comparing the congressional resources with those available to the president: "I think we have exceeded the congressional ability to deal with what the executive is doing and I think this is something you may well want to deal with in this study of yours." Chairman Daddario was receptive to Wiesner's remarks and assured him that his committee would look into the need for a mechanism for improving the Congress's capabilities for science and technical advice.

From these first hearings forward, the idea of a separate mechanism for advising Congress became a focal point in subcommittee activities. Among the most critical factors governing the subcommittee approach to this issue were the conclusions ex-

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pressed in a staff study completed in 1964, aptly entitled,"Scientific and Technical Advice for the Congress: Needs and Sources."[10] The report noted in its opening paragraph that "Congress in the past few years has become increasingly concerned with the problem of obtaining adequate information and advice on subjects of a scientific or technical nature." Then, reiterating others' concerns, it went on to observe that one of the primary justifications driving this issue was the fact that an increasingly large percentage of the federal budget was going toward the funding of research and development.[11] The issue of tension between the legislative and executive branches forms a strong undertone to the study. In their initial efforts to assess the matter, for example,"it became clear that one important aspect of the congressional advice problem centered about the relative merits of setting up some body of highly trained scientists or technicians to be *responsive primarily, if not solely, to the Congress.* "[12] Although the study found no consensus regarding what type of advisory system should be established, it is clear from their findings that the need to set up some mechanism, independent of the executive branch, was of paramount importance.

Rather than recommending establishment of a new agency, however, the study recommended better utilization of existing resources such as the National Academy of Sciences and the newly established National Academy of Engineering, strengthening committee

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staffs and the Legislative Reference Service through the addition of technically trained people, and continuing to survey the congressional committees regarding their need for advice. Although no bold action regarding the advice issue was taken at that time, the issue did not disappear. But at this juncture, another area of concern became critical. Reflecting wider trends prevailing in the United States, Daddario and the subcommittee became increasingly concerned with the relationship between technology and the environment. It was from these concerns that the original concept of "technology assessment" (TA) emerged.

Indeed, in its next major report, TA became a primary concern of Daddario's subcommittee.[13] This concept, although related to efforts of improving advice for the Congress, has its origins in the particular interests of the subcommittee's chairman. It seems clear that there was more on Daddario's mind, and indeed more to the subcommittee's mandate, than merely improving scientific and technical advice available to Congress. In addition to being established for the purpose of coordinating scientific and technical information for the Congress, the Subcommittee on Science, Research and Development was created to take a greater role in directing scientific and technological development. Indeed, in the Subcommittee's first report, "A Statement of Purpose" from 1963, Chairman Daddario had outlined his view of the subcommittee's role:

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> For 150 years the United States could and did depend mainly on ingenuity, industry, independence and pioneering of its people…Then the situa–tion…shifted radically…the new need was technology. But Congress…finds itself squarely faced with the many social, political, and economic side effects created by the current technological revolution…Congress has long promoted science [but]…inevitably serious problems have accompanied progress… Indeed there are those who contend that the galloping technical revolution is threatening to outrun the number of talented people necessary to nourish it, as well as the time needed to plan and direct its course with some degree of wisdom.[14]

Thus, from the beginning, Daddario was interested in moderating or directing the technological revolution. The evolution of the subcommittee's agenda from coordinating information for Congress to assessing the impact of technology reflected Daddario's concern with technology as a force that needed more conscious management.

Daddario, however, cannot be characterized as a Luddite swept up in a growing anti-technology movement of the 1960s. Rather, he viewed the greater use of science and application of technology as essential. If anything, he seems to have been more amenable

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to the idea of the technical fix than to impeding technological development. Support for science was necessary, Daddario maintained, because "new and fundamental knowledge must be obtained in all fields of science if we are to make any real progress towards a better life for our citizens."[15] He was, however, becoming increasingly concerned with the negative side effects of technological progress, and in particular the deteriorating environment.

This concern prompted Daddario to lead his subcommittee into an exploration of the possibility of a TA mechanism for the Congress, an idea first announced in 1966.[16] After several hearings and commissioned reports, legislation was ready in 1970. Daddario introduced H.R. 17046 on the floor of the House in April 1970:

> Mr. Speaker, probably the greatest single force for both good and evil which is abroad in the land today is technology. In large part the destiny of the human race depends on what we choose to make of science and its handmaiden, technology. This is not just an isolated opinion. It is shared by an overwhelming majority of the most thoughtful and best educated people in this Nation.

Then, having stated that the worth of technology depends on "how men handle it," he went on to describe its impact. "There is scarcely a major existing ill which cannot in

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some manner be traced to technological application," he argued, and then added, "nor is there one whose solution does not lie, at least in part, with better managed and better used technology." Arguing for the need for TA to better manage technology and the environment, he continued, "The most glaring example at the moment is environment….Until we learn really to understand technology—how and when to apply it; how and when not to apply it—we shall never overcome the many, complex difficulties that beset us." Daddario went on to define TA as 'the evaluation of the impact of existing, new and developing technologies upon society…to assess both the desirable and the undesirable consequences of such technology…In other words…to give us better mechanisms for anticipating short- and long-range potentials of technology—good and bad."[17]

Although introduced in 1970, the TA bill did not secure approval of the Rules Committee until 1972 and, in the meantime, the committee worked further to refine the measure. The bill's path proved to be rocky as suspicion of, and charges against, the idea of TA became more formidable. Signs of this reaction were evident in the early committee hearings.

The element of governmental power and control over private industry, apparently inherent in a TA capability, was not universally applauded. Larry E. Ruff, a professor of economics at the University of California at San Diego, provided some of the most

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disconcerting testimony the subcommittee was to hear. An unabashed believer in the power of the market to deal with technological problems, Ruff was suspicious of the "micromanaging" nature of the idea of TA. Ruff could not "let pass unchallenged the assumption that TA of the type described above is a useful or even a harmless exercise, or is, indeed possible."

For him, "The world, and especially human societies, are just too complex and interrelated for anyone, or any committee, to determine the direct and derivative effects of technology, even in the past." According to Ruff, "to solve our environmental problems we do not need expert assessments or estimates of this type. Rather…you should work on providing what is lacking—the market…by making each polluter pay a fee.[18]

Ruff's statement was symptomatic of a growing hostility to TA based on the perception that what it really meant was the regulation of technology. Critics of governmental interference in the innovative process began deriding the concept as "technology arrestment" and "technology harassment." Champions of unfettered technological innovation, especially leaders from industry, feared "harassment by hysterical (and hardly democratic) scientific Philistine, principally from the sinister side of the political spectrum,"while some even went so far as to claim that "TA can subvert the principles at the very heart of democracy."[19]

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Daddario responded rather vehemently to the suggestion that TA was to be the nit-picking regulatory activity that Ruff and others portrayed. Sensitive to charges that TA was really regulation in disguise, Daddario emphasized the value in the information it would provide Congress:

> I would think that one of the problems we are having here is that you see assessment as another form of rule and regulation, which, if you were to examine the assessment studies that have been made and the thoughts about it by the committee, is exactly what we do not intend to do….The Congress must have the ability to recognize what the implications are of complicated and scientific and technical ventures in order to be able to develop a program which can be an effective one.
>
> It [the committee] has not said that it is going to regulate every gadget that comes down, but rather look into the very complicated mechanisms which are involved in congressional programs for the purpose of being able to make an assessment of how these programs can work better than they have in the past.[20]

Thus, Daddario and his colleagues, wary of conveying the impression that TA was regulation, began focusing instead on the information value of an independent technology

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assessment organization for Congress.

In late May 1970, during the final set of hearings to solicit testimony for the legislation, Missouri Democrat James Symington in his opening statement placed the proposed OTA in the middle of the executive-legislative power struggle.

> There is a bill before the Congress today which was drafted and introduced by Chairman Daddario of this subcommittee, along with Mr. Mosher…which would establish an Office of TA serving the Congress…because clearly we, as an institution, that is, the Congress, have been gravely uninformed and have lacked sufficient guidance to make really useful and wise decisions in this field in the past. We have tended simply to accede to administration initiatives, which themselves from time to time may have been hastily or inaccurately promoted.[21]

Daddario, too, began highlighting this aspect of a TA body, arguing that the proposed OTA would address the need for independent advice, as well as environmental issues. He then emphasized the role that the OTA would play in redressing the imbalance of federal powers. In his most forceful language on the topic to date, perhaps getting ready for the legislative battle in the House, he stated,

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> Since 1963, a large portion of the Subcommittee efforts have been to develop avenues of information and advice for the Congress with outside groups. We have recognized the important need for developing independent means of obtaining necessary and relevant technical information for the Congress, without having to depend almost solely on the Executive Branch. In my view, it is only with this capability that Congress can assure its role as an equal branch in our Federal structure.[22]

## *Establishing the OTA*

The House Rules Committee finally cleared the bill for consideration in early 1972. Renamed H.R. 10243, debate began in the House on February 8, 1972. Although the champions of the TA concept had to continue to deal with the specter of regulation in the course of committeework, a new objection emerged. Wary of surrendering power to a new external organization, members of Congress, traditionally jealous in matters of jurisdiction, feared that the proposed office might infringe upon their authority. Representative Delbert Latta, a conservative Ohio Republican and member of the Rules Committee, immediately questioned the policy-making powers of the office, remarking,

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> the report reads as follows: "The Office would be composed of a policymaking body called the TA Board." Really "policymaking body" is a poor choice of words, as actually it is not going to be a policymaking body in the real sense of the word, but it is only going to be permitted to make its own rules. It is going to work for this Congress and not be making policy for it.[23]

The new chairman of the Science, Research and Development subcommittee, Georgia Democrat John Davis, who had taken over responsibility for the legislation after Daddario left the House to run, unsuccessfully, for Governor of Connecticut, quickly reassured Latta and the assembled body:

> I agree with the gentleman from Ohio. He is absolutely correct. Perhaps "policymaking" was an unhappy choice of words. Certainly it is not contemplated the Office of TA would have any policymaking powers whatsoever with respect to Congress.

Then beginning the general debate, Davis quickly placed the OTA in the role of redressing the imbalance between branches: "It is important to note that the bill is designed to provide informational aid for the Congress, not for the executive branch. The OTA

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would be at the disposal of any committee of the Congress, but it would not," he reassured the members,"assume any congressional function—oversight, investigative, or otherwise. It would function entirely in a supplemental fashion."

Speaking from the Republican side, Charles Mosher of Ohio, the ranking minority member on the Science, Research and Development subcommittee, argued for the office claiming it was essential to buttress the Congress's position:

> Too often, we in the Congress are flying blind—or at least much more in the dark than is necessary or good—to the extent that we do not obtain better information and advice than we now have so as to be more sure of what we are actually doing when we make decisions which involve the use of new technology.

Referring to the deficiencies of Congress, he implored,

> Let us face it Mr. Chairman, we in the Congress are constantly outmanned and outgunned by the expertise of the executive agencies. We desperately need a stronger source of professional advice and information, more immediately and

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> entirely responsible to us and responsive to the demands of our own committees, in order to more nearly match those resources in the executive agencies.

Mosher went on to explain that the OTA, unlike the Library of Congress, would not be subject to individual member requests but only to committee requests because "the studies and reports contracted by the OTA will usually be of a much larger, more comprehensive scope, applying major technology decisions that are before a committee." He then brought up the matter of its autonomy and explained that the Office of Technology Assessment will "perform only staff work for the Congress" and "will not be a decisionmaking body, nor a policymaking body." "The OTA shall solely be a servant of the Congress; its fundamental function will be to supply us with much more comprehensive, accurate, significant, technical advice and information than is now available to us. It will be created solely to help us do a better job."[24]

Others who endorsed the bill agreed "that without this kind of assistance, the Congress is going to find itself in the course of time unable to deal with its constitutional responsibilities, and, therefore, it is going to experience a continual erosion of its constitutional authority."[25]

Some Republican members were leery of the price tag. One was Representative Larry

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Winn of Kansas, who in the 1970 hearings had expressed his belief in "the great benefit of this piece of legislation," but argued, "I am trying to get the job done and save five million dollars in some way." Similarly, Winn's fellow Republican James Fulton of Pennsylvania had wondered "what the savings might be" if the Library of Congress's Legislative Reference Service [now Congressional Research Service] could assume the duties of the proposed OTA.[26] These concerns, reflective of critiques being raised today by those who wish to eliminate the OTA, resurfaced in the debate on the bill in 1972.

Iowa Republican H.R. Gross, enjoying a reputation for great frugality during his 26-year tenure and being a member who "made just about every bill manager with a request for federal funds study his bill a little more carefully,"[27] suspected a waste of money: "Mr. Chairman, to hear this bill explained, one would think that the millennium had been achieved or we are on the threshold of the millennium; that the creation of a new board in Government is going to save I do not know how many billions of dollars."

If it would really save money he said he would favor it. "But," he argued, "this is going to add one more boondoggling board to what we already have." Gross questioned whether it would be better to "turn over to the General Accounting Office this TA, and let them hire the few people that would be needed? Why create another board in Government?"[28]

Gross was not alone; the spirit of fiscal restraint moved other members as well. Fellow

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Republican John H. Rousselot of California agreed with Gross's complaint: "Somehow the Members of this Congress should begin to come to grips with the problem of controlling this massive expanding bureaucracy that grows all around us here in Washington." He then asked Davis "if it is not possible to give more adequate staffing to our present congressional space committee that we have right here in the House."[29]

These comments prompted Davis to rejoin,

> The Jurisdiction of the Committee on Science and Astronautics is primarily science and astronautics. The problems that technology poses to our society include problems which affect every committee of the Congress on either side of the Capitol. The fact that you might try to put all of this in the Committee on Science and Astronautics would pose any number of problems which would involve the jurisdictions of the Committee on Interstate and Foreign Commerce, the Committee on Agriculture, or almost any other committee you might want to name.[30]

The OTA did not become a completely partisan issue, however. Marvin Esch of Michigan, a moderate Republican and a supportive member of the subcommittee, gave a strong endorsement for the OTA, drawing on both themes: the need to better manage technology

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and the executive-legislative issue.

Then referring specifically to the proposed OTA, Esch stressed, "It should be emphasized that these are informational functions; not functions of control, or even recommendation. These functions are designed to supplement existing systems of acquiring information, such as the hearing system."And he reiterated, hoping to forestall charges of encroachment on congressional authority, "I emphasize again that the Office of TA is not intended to make recommendations as to what course the Congress should follow, nor to predetermine any issues."[31]

Earlier in the debate Mosher had attempted to address the notion that existing agencies could perform TA. Attempting to quell such a notion, he reasoned,

> Today, there is strong, competent staff help for many of the congressional committees. But I submit that our present staffing does not even pretend to provide, nor could today's staffs provide, the comprehensive systems analysis assessments of complex technologies, and their consequences, which we are proposing in this legislation, and for which there is a vital need.

Then, in remarks which call to mind the most recent arguments against the OTA, he went on to note, "Also, let us clearly recognize that the Congressional Research Service

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in the Library of Congress does not and will not provide the assessment services we are proposing in this bill."[32]

For Mosher it was "very important to recognize that the Office of TA, as proposed in this bill, will be strictly supplemental to the services performed for us by the Congressional Research Service and the General Accounting Office [GAO]." He stressed that, in comparison with existing agencies, the proposed OTA would be "analogous to the GAO and the Library's Research Service, only in that it will be distinctly an arm of the Congress alone, an instrument for the Congress alone to use, and responsible only to the Congress."

"Of course," he assured his colleagues,

> we considered carefully whether this TA function should be placed in the already existing GAO or Congressional Research Service, and the evidence was convincing that it should not be. To be effective it should be separate. GAO makes its examinations after the fact, after the water is over the dam. The essence of our bills is to anticipate far more accurately in advance the consequences of our decisions here. And even though the Congressional Library has great competence in many respects, it does not have the type of competence,

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> nor traditionally the thrust, the interests and attitudes intended by this new legislation.[33]

As its champions had presented it, the OTA would assist congressional oversight, help Congress save money, yet remain responsive, responsible, and accountable to the Congress. But Texas Democrat Jack Brooks wanted to be sure of this. He proposed an amendment to bring the office under tighter congressional control. As the last order of business before voting on the bill, the House took up Brooks' amendment; his argument suggests that without the emphasis on TA for Congress versus the executive branch, this bill would not have passed. Congressmen such as Brooks were receptive to advice for Congress, but if and only if it were strictly under the arm of the legislative branch, and his remarks make this abundantly clear.

"This bill provides for the executive branch to run and control this office," Brooks asserted. According to the original bill, the president was to appoint four public members to the TA Board (TAB), which was to directly oversee the office and appoint the director. The Congress was also to contribute four members: two from the Senate and two from the House. But with the president having control over the four public members as well as the director of the CRS and the Comptroller General,

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Brooks felt that with a total of six on the board under his influence, the office was clearly going to be controlled by the president. He deduced, "So the President then in effect picks out this Director and that gives him 7 to 4. Now, you do not have to be very good to run an agency of that kind when you have got 7 to 4."

Brooks then offered his alternative of a TAB consisting of five members from each house, three from the majority party and two from the minority, who would then select the director, "and that agency," he insisted, "will then be responsive to the U.S. Congress, not to the Executive," He concluded his proposal by saying, "I say that we would be wise if we are going to spend enough money to have 50 or 60 or 70 experts that we, the Congress of the United States, are going to name them."[34]

Apparently, the assembled members were persuaded as they approved the amendment that changed the makeup of the TA Board from one comprised of four congressmen, the Comptroller General, the head of the CRS, four public members appointed by the president, and the director to a new configuration consisting completely of congressmen. The House then approved the amended bill on a roll call vote of 256–118, with Democrats clearly favoring the bill 180–39, while Republicans were split 76–79. The Senate passed the bill on a voice vote and President Nixon signed the bill into law on October 13, 1972.

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*Congressional Control Over the Office*

Having trouble finding office space, the OTA did not begin operations in earnest until early 1974. As a result of a compromise in a Committee of Conference with the Senate, the TAB was modified to 12 members of Congress, with six from each house and an equal three from each party. The TAB, comprised solely of congressmen, became in effect a bipartisan joint committee overseeing the office and its director. Recognized within Congress as the "father" of the TA concept, Daddario's appointment as the OTA's first director came as a surprise to no one.

Because input of leaders from the scientific and technical communities was critical to the original concept of TA it was also agreed in Conference that advice from experts outside of government would be provided by a newly devised TA Advisory Council (TAAC). The relationship between the TAB and the TAAC did not prove to be one of an equal partnership, however. The TAB, comprised of congressmen, continued to view the OTA as a repository of independent information untainted by the executive branch. Thus, rather than allowing the OTA to launch into a bold new intellectual and governmental adventure, the TAB kept tight reins on the OTA from the beginning.

Recalling the jealousy over potential policy making by the OTA expressed during the floor debate, the TAB immediately limited the TAAC's role. It became clear from the

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outset that securing public input for choosing assessment topics and thus influencing the nation's technology policy was to be secondary to the primary role of the OTA: providing objective information for congressional committees. In the first joint meeting of the TAB and TAAC, congressional control became apparent. After the members of the TAAC began discussing various ideas, including improving environmental policy, Mosher, serving as the first Vice-Chairman of the TAB, cut them back:

> Apropos of what you gentlemen are saying…I hope we are all aware of one fundamental fact on TA and, in fact the Advisory Council, that neither of these bodies is in itself considered to be a policy-making body. I hope we all understand that. The Congress would immediately rebel if there is any indication that the Office of TA is going to be making policy decisions…We are only aides to the Congress and to the legislative process…we are going to have to be extremely careful in the assessment jobs we take on.[35]

It became clear that the office was not to make policy and that the TAAC was not to be responsible for coming up with ideas for TAs, but was rather to serve as "a sounding board for advice" on topics culled from congressional committees. Instead of canvassing the TAAC for ideas, the first item of business was a survey of congressional staffs to get

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"an idea of their priorities for legislation." Republican TAB member, Senator Clifford Case, was quite concerned that the office remain responsive to Congress by keeping committees informed on the status of their requests for assessments.[36] For those who had held high hopes of the OTA providing a channel for public input into technology policy, early developments were not promising. Rather than serving as a "monitoring": and "early warning" agent to alert Congress to adverse technological developments, as Daddario had originally envisioned the concept, request for specific TAs were coming from Congress itself and the office's main order of business shortly became providing technical advice as requested, *ad hoc,* by members of Congress. But even in this capacity of offering supportive, if subservient, advice on topics already chosen, the TAAC's role was quickly reduced. In fact, the TAB precluded its input into the selection of the very first assessment.

The first report the office undertook was a study on the viability of generic drugs. The process through which the TAB approved this study was an inauspicious beginning for those who had been resting their hopes on the OTA as a conduit for public input into technology policy. The TAB's first chairman, Senator Edward Kennedy, proposed the study in order to help his Health and Scientific Research subcommittee in the Senate resolve an argument between drug manufacturers and administration experts who had

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provided contradictory testimony regarding whether or not alternative, generic drugs could in fact be produced. The original plan had been to wait for TAAC's input into proposed TAs before approving them, but when Daddario informed the group that the TAAC was not scheduled to meet for another month, Kennedy and the others were reluctant to wait. Senator Ernest Hollings, a South Carolina Democrat, became the most adamant. "It's ridiculous," he exclaimed. Why are we waiting on all this staff stuff…why don't we approve of that and just get going?"[37] Daddario, anxious to get under way and placate his congressional bosses, accommodated the board, "Senator, so far as the advisory committee is concerned, I don't think we ought to wait before going ahead."[38]

In contrast to the quickly diminishing association with the TAAC, relationships with congressional committees and their staffs were nurtured and their inputs and received a different priority. At the very next meeting, Daddario responded to an inquiry from Senator Case in this regard, assuring him that

> participation in the assessment process by the interested congressional staffs…is an integral part of the activity…[and] there will be a constant involvement not only at the congressional level but at the staff levels in these, so

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that there can be a direct relationship to committee activities, committee hearings and the like.[39]

This marginalization of the TAAC led to the resignation of its chair man, Harold Brown, then the President of the California Institute of Technology, in 1975. And although promises of improving public input were made, the reality never corresponded to the original TA concept, *i.e.*, that leaders from the scientific and technological communities would keep "tabs" on technological developments and make assessments as to whether or not such technologies should be pursued. Instead, right from the beginning, the OTA was tightly reined in by its congressional overseers. Rather than assessing the consequences of alternative paths of technological development, parity of information among branches of government remained a main concern. In this context, at one of the first TAB meetings, Senator Hubert Humphrey saw the value of the OTA as placing the Congress "in a position to at least give the executive branch, as it comes up with a program, some healthy competition of ideas."[40] Similarly, the office was defended on those grounds in front of the Appropriations Committee by Kennedy:

The purpose of the Office is to provide Congress with its own technical expertise…. Over the past two decades the executive branch's capability in science

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> and technology has grown immensely, while the ability of Congress to evaluate such programs has stumbled along at a snail's pace.

Drawing the office into the power struggle exacerbated by Watergate, he averred,

> Mr. Chairman I believe that recent events have indicated to members of both houses the need to strengthen the Congress to meet its responsibilities, now and in the decades ahead. The Office of TA is a vital resource to assist Congress in achieving that goal.[41]

In its early years, the office evolved into an on-demand advice mechanism for Congress as opposed to developing into a more autonomous agent for contributing to a coherent technology policy. Originally, TA was to provide expert input from the outside in order to inform policy making. With the TAB in control, however, topics for TA in the OTA were picked by "insiders" and outside experts were consulted only in a *post hoc* manner. They were asked to provide input on topics that had already been decided by congressional committee chairmen and the congressmen on the board.

Thus stripped of its autonomy and managed in its formative years by Daddario, who had to remain sensitive to congressional committee chairmen in the TAB and in Congress

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at large, the OTA's purview remained limited. Although OTA produced studies that were acclaimed for their objectivity and balance, they were not nearly as far-ranging as the original advocates of "assessment" had hoped. In fact, they did not come close to resembling the broad monitoring function that the early plans for the office had envisioned.

In 1977 Daddario resigned as OTA director and was eventually succeeded by Russell Petersen, a former Governor of Delaware. Under its second director, OTA tried to branch out and assume a more assertive role and was nearly eliminated. Petersen, an active environmentalist, tried to move the OTA back toward the concept and make the office a policy informing organization bringing facts and ideas to the Congress from the outside. As one of his first orders of business, Petersen developed a "priorities list" of prospective assessment topics. But seeking greater autonomy for the office did not sit well with his congressional overseers, and his tenure proved to be brief, lasting scarcely a year.[42]

After Petersen departed to head the National Audubon Society John Gibbons, a respected physicist at Oak Ridge National Laboratory and former head of the Energy, Environment and Resources Center at the University of Tennessee in Knoxville, was brought in for what many on the inside realized was OTA's last chance.[43] Taking over in 1979, Gibbons achieved gains in bureaucratic reform, such as ending cost overruns, but more importantly, he brought the office back into the role of unbiased servant of Congress

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and away from the Petersen plan of a more independent policy input. Under Gibbons the office increased its reputation as a competent, loyal and responsive information agency for Congress, as evidenced by a newly implemented "annual survey of committee needs."[44] Emphasizing "advice on tap," Gibbons won praise for his stabilization of the office, directing it not towards advocacy but toward reliable information source for Capitol Hill during his 14-year tenure.

One brief controversy illustrates the difficulties that TA would engender if the office tried to "assess" rather than just provide objective information on contentious issues. In 1984, the "Star Wars" debate injected the OTA into the center of a scientific-technical controversy similar to the ABM and SST struggles.

In the ABM and SST affairs, expert opinions were believed to be tainted.[45] Suspicions were confirmed when President Nixon abolished the Presidential Science Advisory Committee in January, 1973. Nixon had become upset with what he perceived as insubordination to the Administration's proABM and proSST positions by advisers who opposed the programs before Congress. During the Reagan Administration, the Strategic Defense Initiative, or "Star Wars" missile defense issue arose in an almost identical manner as the ABM controversy. Not only was the technology at issue similar, *i.e.*, missile defense systems, but, not surprisingly, the same kinds of political issues emerged: the prevailing

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balance of powers, violation of treaties, and the question of whether the project was in fact technically and economically feasible. Here, as did the science advisers under Nixon, the OTA came out against the administration's position.[46] The OTA itself became a partisan issue that year when the administration charged that the office exposed sensitive defense secrets.

The charges did not hold up, and the OTA overcame this scare.[47]

Subsequently, however, it largely steered clear of contentious issues and assumed its role more as a low-profile respondent to congressional requests under Gibbons, who remained at the OTA until 1993. After Gibbons was named Science Advisor to President Clinton, Roger Herdman, a former Vice President of the Sloan-Kettering Cancer Center, took over the reins at the OTA. Continuing the pattern established by Gibbons, the office has been enjoying a reputation as a provider of widely recognized high-quality, if less controversial, studies.

Although the OTA has moved away from the proactive approach envisioned by early champions of TA, it has nevertheless evolved in a way very much in accord with the expressed desires of those on Capitol Hill. In so doing, it has kept out of controversy or even advocacy, but now, precisely because of its responsiveness to Congress and a less far-ranging approach, the criticism that its duties can be performed by another agency has

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resurfaced. Twenty-five years ago, officials at the CRS, then called the Legislative Reference Service (LRS), were asked if LRS or the GAO could perform technology assessment. In light of current concerns, it is worthwhile to examine their responses.

During the committee hearings setting up OTA, the director of the LRS, Lester Jayson, foresaw cost advantages in locating the entire TA function within the Library of Congress which housed the LRS. He believed that the LRS had the necessary experience in that "studies of specific technologies and their impacts on society are routinely performed by LRS as a part of its fiction of advising the Congress on scientific and technological matters." He also noted the GAO had also "conducted reviews and analyses" similar to that of TA, and thus, he believed, "either agency or both could reasonably serve as repository for the proposed expanded function of TA."

Savings to the overall federal budget could be achieved, he felt, through reducing overhead costs such as building, equipment, and administration by utilizing one staff instead of two, particularly insofar as senior staff were concerned. He summarized these types of cost advantages with the simple formula, "two agencies require more support than one."[48]

Although he believed at the time that the LRS "would need still further enlargement to carry out the additional functions of contract administration implicit in an OTA operation

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as we understand it," he did feel that staff expansion in the Library of Congress was feasible by building on "the present LRS team of specialists as the nucleus of an organization." This was possible, he reasoned, because this group was "already familiar with the broad scope of subject matter," and thus "provides something substantial to build on."[49]

But Jayson also acknowledged some disadvantages of incorporating TA into the LRS: "It should be pointed out, however, that the prospect of assigning complete TA function to LRS would not be without serious costs and disadvantages." He cited that,

> any assessment of serious portent is sure to be controversial. LRS has no history of having to survive public exposure of its assessments. It has not had to be accountable to the public. It has no experience in having to defend itself against interests that would endeavor to modify or suppress studies.…LRS has not provided testimony, made substantive recommendations as to priorities or criticized the Executive Agencies before Congressional Committees.[50]

Bearing in mind the "great increase in public exposure of LRS," Jayson worried that "on matters of great moment, high economic impact, and intense emotional feeling bias will be imputed to the most objective of statements." In his opinion, any agency thrown into such a mix "must command respect, enjoy durable public support, and operate under

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the protection of insulation from powerful dissident factions and their political supporters."He quickly added, "No agency of government possesses all these attributes." He closed,

> Conceivably, the LOC—specifically, the LRS—by the exercise of discretion in its choice of initial tasks, reliance on its established reputation for objectivity, and selection of additional personnel of highest professional prestige and qualifications, could achieve a solid credibility for its output.[51]

When a TA mechanism was first considered, it seemed apparent in light of issues like the ABM and SST controversies, that it would be thrust into the midst of contentious issues. As it has evolved, however, the OTA has been received most favorably by its congressional bosses when it has avoided positions of advocacy and served, instead, as a less politically charged information source for congressional committees. Therefore, it seems that the drawbacks cited against injecting a potentially politically controversial organization into the Congressional Research Service no longer seem relevant.

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*Dilemma for the OTA*

This is the crux of OTA's ongoing problem: In order to earn a reputation for being unbiased, it has had to dodge controversies, into which, 25 years ago it seemed the OTA would be thrown, but in not being so involved, the OTA "risks becoming invisible."[52] Moreover, since the OTA generally is not injected into such controversial issues and, indeed, has been historically criticized for that, Jayson's reasons as to why the LRS could not take on controversial issues now seem moot.[53] The noncontroversial posture of the OTA is not the result of timidity within the OTA, however, but results from the fact that the office was designed as an information source independent of the executive branch and "responsive and responsible to Congress" and has operated as such. It has had to be careful not to upstage Congress by attempting to make policy. And, as it was set up by Congress with the idea of shoring up the Legislative branch in the three branch system, information for, and responsiveness to, Congress became the primary force in its formative period. Thus, the congressional overseers on the TAB have chosen the assessments. But this status and role as information agent places the OTA in a difficult position. As it has become a more information-oriented agency, as opposed to a policy advocate "assessing" alternatives, it now more closely resembles the CRS than it did in its hypothetical stage 25 years ago. This has left the office in a difficult position when faced, as it is now,

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with fiscally-motivated plans to abolish it.

Pennsylvania Republican Robert Walker, the new chair of the House Science Committee, has announced that if the OTA is to remain, its studies must be more short-term and responsive to the appropriations process.[54] This, however, would completely abandon any remaining vestiges of the original TA idea still present in the OTA. Unlike the CRS, OTA studies remain of a more long-term nature. If, indeed, the desire is to make the OTA replicate the CRS, then the critics will have foreordained the OTA's elimination. There will be nothing left to separate OTA work from the kind of things CRS is commissioned to do. Moreover, transformed in this way, TA will have nothing in common with the idea as it was envisioned when the office was established. Although OTA has already considerably departed from the original idea, placing such time constraints on its work would be the end. If there is a problem with the office, it is not because it is an agency that is unresponsive to Congress; that hurdle has been crossed during the course of the OTA development. If Congress has a continued concern over its responsiveness, the timeliness of its studies, or the scale and scope of its reports, it arises as a result of the last traces of the original TA concept office's approach. If these traces are removed, there no longer appears to be a rationale for an office separate from the CRS.

Obviously, this presents the OTA with a problem in confronting a conservative Con-

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gress bent on reducing expenditures, as well as having an inclination to oppose anything smacking of industrial policy. In a classic Catch-22, the obvious defense of the office will likely lead to its demise.

On the one hand, if it claims to be more than an objective information agency, tending toward a more autonomous or assertive role with respect to technology policy, it would apparently be doomed in the face of Republican control of both houses. On the other hand, if it justifies itself solely as a provider of timely advice, as Republicans seemingly desire, then it is hard to argue that an office beyond the CRS is really necessary.

In terms of immediate outlook, the OTA's future likely depends on whether or not it can successfully persuade its congressional judges that the organizational capability it has achieved over the past two decades for providing technical advice will be hard to match. Historically, however, the OTA is best understood as a part of the broader congressional reforms of the 1970s, the most visible of which were the War Powers Act in 1973 and the creation of the Congressional Budget Office in 1974. This suggests that if the office is to prevail, its advocates should sell the office, as proponents did back in 1972, and argue that Congress needs a scientific and technical advice mechanism independent of the president that can only adequately be provided by the more long-term outlook of the OTA's studies.

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# Technology Assessment and the Work of Congress

In addition to the individual fate of the OTA, a move to eliminate it may have broader historical ramifications. At its founding in 1972, the OTA was only the third independent congressional agency ever established. In many ways, it represented a bold move by Congress and the first step of the reformist 1970s—a period in which "Congressional politics had undergone considerable change" and a decade in which "Congress studied itself more…than at any time in its history."[55] This scrutiny also led to reforms, but in order for reforms to occur, "conditions must be right, and the most important [condition] appears to be the perception among members that the institutional authority is threatened."[56] Rather than a new foray into assessing technology, Congress established the OTA in order to shore up legislative branch powers. Although the War Powers Act and the Congressional Budget Office are, perhaps, more visible signs of the changes that took place in congressional–presidential relations in the 1970s, it seems clear from the history of the OTA that the underlying causes which gave rise to the institution place it firmly in this pattern. And, given its early beginnings, which predate the two above-named acts, the agitation for increasing Congress's scientific and technical capability—and the resultant process that culminated in the OTA—place it at the beginning of this sea-change in legislative-executive relations.[57]

Thus the question of eliminating the OTA becomes certainly not one of reducing

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regulation, since the office never became the assertive policy influence favored by some, but one of cutting back one of the institutional reforms begun to countermand a perceived and very real encroachment on the legislature by "the imperial presidency." And, in that case, the scaling back of OTA may have broader implications for the roles of the respective branches of government in the tripartite federal system.



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## *Notes*

1.*The New York Times* (December 6, 1994), p. Al; N. Gingrich, *Contract With America* (New York: Times Books, 1994).

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2. Quoted in J. Mervis, Technology Assessment Faces Ax," *Science* Vol. 266 (December 9, 1994), p. 1636.

3. United States Congress, House Committee on Science and Astronautics, "Panel on Science and Technology, Fifth Annual Meeting, Proceedings," U.S. 88th Congress, 1st Session (Washington, DC: U.S. Government Printing Office, 1963), p. 37.

4. *Ibid.*, p. 38.

5. U.S. Congress, House Committee on Science and Astronautics, Subcommittee on Science, Research, and Development, "A Statement of Purpose: The First Progress Report of the Subcommittee on Science, Research and Development," U.S. 88th Congress, 1st Session (Washington, DC: U.S. Government Printing Office, 1963), pp. 12–14.

6. U.S. Congress, House Committee on Science and Astronautics, Subcommittee on Science, Research, and Development, "Government and Science, No. 8: Hearings before the Subcommittee on Science Research and Development," U.S. 88th Congress, 1st Session (Washington, DC: U.S. Government Printing Office, 1963), p. 32.

7. 1963 is an important year. While in 1962 the NASA budget passed unanimously, in Spring of the next year, the first major opposition to the space program emerged because of the rapidly expanding NASA budget. Indeed, historian and former member of the Science and Astronautics Committee, K. Hechler, has termed this period the "end of the

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Honeymoon." U.S. Congress, House Committee on Science and Astronautics, K Hechler, "Toward the Endless Frontier," U.S. 96th Congress, 2nd Session (Washington, DC: U.S. Government Printing Office, 1980), p. 124.

8. Senate, *Congressional Record* (August 13, 1963), pp. 14809-14810.

9. "The View From Congress," *International Science and Technology* Vol. 57 (September 1966), p. 70.

10. U.S. Congress, House Committee on Science and Astronautics, Subcommittee on Science, Research, and Development, "Government and Science, No. 3, Scientific and Technical Advice for the Congress: Needs and Sources," U.S. 88th Congress, 2nd Session (Washington, DC: U.S. Government Printing Office 1964).

11. The other reason cited was the "forceful impact of science and technology upon our contemporary civilization." *Ibid.*, p. 1. 12. *Ibid.*, p. 3, emphasis added.

13. U.S. Congress, House Committee on Science and Astronautics, Subcommittee on Science, Research and Development, "Inquiries, Legislation, Policy Studies Re: Science and Technology: The Second Progress Report of the Subcommittee on Science, Research and Development," U.S. 89th Congress, 2nd Session (Washington, DC: U.S. Government Printing Office, 1966).

14. United States Congress, "A Statement of Purpose," *op. cit.* (1963), pp. 1-2.

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15. Daddario was consistently viewed by the scientific community as an ally, a perception due especially to his oversight of NSF and he worked hard at maintaining his reputation, earning him the informal title of "Mr. Science" in the House. United States Congress, K Hechler, "Toward the Endless Frontier," *op. cit.* (1980) p. 147.

16. The idea was first mentioned in a committee report. United States Congress, House Committee on Science and Astronautics, Subcommittee on Science, Research and Development, "Inquires, Legislation Policy Studies Regarding Science and Technology: The Second Progress Report of the Subcommittee on Science Research and Development," U.S. 89th Congress, 2nd Session (Washington, DC: U.S. Government Printing Office 1966), pp. 27-28.

17. House, *Congressional Record* (April 16, 1970), p. 12110.

18. U.S. Congress, House Committee on Science and Astronautics, Subcommittee on Science, Research and Development, "Technology Assessment and the Environment: Hearings before the Subcommittee on Science, Research and Development," U.S. 91st Congress, 2nd Session (Washington, DC: U.S. Government Printing Office, 1970), pp. 361-364

19. Leon Green of Lockheed Corporation and William O. Baker of Bell Laboratories, quoted in D. Medford, *Environmental Harassment or Technology Assessment* (New York:

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Elsevier, 1973), p. 52. 20. United States Congress, "Technology Assessment and the Environment," *op. cit.* (1970), p. 372. 21: *Ibid.*, p. 794.

22. *Ibid.*, pp. 739-740.

23. House, *Congressional Record* (February 8, 1972), p. 3201.

24. *Ibid.*, p. 3203.

25. *Ibid.*, p. 3208.

26. U.S. Congress, House Committee on Science and Astronautics, Subcommittee on Science, Research and Development, "Technology Assessment Hearings on H.R. 17046," U.S. 91st Congress, 2nd Session (Washington, DC: U.S. Government Printing Office 1970), p. 18,53.

27. M. Barone, G. Ujifusa, and D. Matthews, *The Almanac of American Politics 1978* (New York: E.P. Dutton, 1977), p. 292. 28. House, Congressional Record (February 8, 1972), p. 3213.

29. *Ibid.*, p. 3214.

30. *Ibid.*, p. 3215.

31. *Ibid.*, p. 3217.

32. *Ibid.*, p. 3203. Notice, however, that in this context Mosher was talking about a more broad ranging, systems-analysis based technology assessment and not just an

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independent advice mechanism. This distinction and its importance for the contemporary OTA will be addressed below.

33. *Ibid.*, p. 3203.

34. *Ibid.*, p. 3220.

35. The Office of Technology Assessment, "Minutes of the Joint TAB-TAAC Meeting," (Washington, DC, January 24, 1974) pp. 40–41. 36. *Ibid.*, p. 59.

37. The Office of Technology Assessment, "Minutes of the Technology Assessment Board Meeting," (Washington, DC, February 6, 1974), p. 75.

38. *Ibid.*, p. 51.

39. Office of Technology Assessment,"Minutes of Technology Assessment Board Meeting," (Washington, DC, February 20, 1974), p. 5.

40. Office of Technology Assessment,"Minutes of Technology Assessment Board Meeting," (Washington, DC, February 6, 1974), pp. 41-42.

41. Quoted in "Minutes of Technology Assessment Board Meeting" (March 6, 1974).

42. Office of Technology Assessment,"Minutes of Technology Assessment Board Meeting," (Washington, DC, November 4, 1977 and January 31, 1979). Petersen also desired to increase input from citizens groups like the Sierra Club, R. Petersen, speech delivered on May 9, 1978, File #0238, Information Center, Office of Technology Assess-

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ment, Washington, DC.

43. The OTA's troubles were compounded by political controversies surrounding Board Member Ted Kennedy who was charged with trying to appoint his long time assistant and Program Manager at the OTA Ellis Mottur, to the vacant directorship created by Daddario's departure. Thomas Southwick, "Hill Technology Assessment Office Hit by Controversy" Congressional Quarterly (June 18, 1977), pp. 1202–1203. The controversy subsided after Mottur withdrew from consideration and later resigned from the OTA. Office of Technology Assessment, "Minutes of Technology Assessment Board Meeting: (Washington, DC, May 8, 1978).

44. Office of Technology Assessment,"Minutes of Technology Assessment Board Meeting," (Washington, DC, September 12, 1979), p. 1.

45. See G. Herken, *Cardinal Choices: Presidential Science Advising from the Atomic Bomb to SDI* (New York: Oxford University Press, 1992), pp. 165-179. 46. "Minutes of Technology Assessment Board Meetings," (September 12, 1985). M. S. Warner, "Reassessing the Office of Technology Assessment," an unpublished paper prepared for The Heritage Foundation, provides a summary critical of the OTA's conduct. File #0240, Information Center, Office of Technology Assessment, Washington, DC.

47. "Minutes of Technology Assessment Board Meeting," (June 21, 1988).

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48. United States Congress, "Technology Assessment Hearings on H.R. 17046," *op. cit.* (1970), p. 54. 49. *Ibid.*, p. 55.

50. E. Wenk quoted by Jayson, *Ibid.*, p. 55.

51. *Ibid.*, p. 56.

52. L. Branscomb quoted in Mervis, Technology Assessment Faces Ax," *op. cit.*, p. 1636.

53. The OTA has been criticized for staying out of defense issues, see B. Casper, "The Rhetoric and The Reality of Congressional Technology Assessment," in T. J. Kuehn and A. L. Porter (eds. ), *Science, Technology, and National Policy* (Ithaca, NY: Cornell, 1981), pp. 315-345. Chairman of the TAAC Harold Brown, also leveled this charge at the OTA from the inside, "Report of Working Papers of the TAAC on TA priorities," (10 June 1975), File #0352, Information Center, Office of Technology Assessment, Washington, DC.

54. R. S. Walker, Press Conference (Washington, DC, December 14, 1994).

55. C. O. Jones, *The Trusteeship Presidency: Jimmy Carter and the United States Congress* (Baton Rouge, LA: LSU Press, 1988), p. 46.

56. *Ibid.*, p. 57.

57. *Ibid.*, p. 57. See also C. O. Jones, *The United States Congress: People, Places, and*

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*Policy* (Homewood, IL: Brooks-Cole,1982) and L. Reiselbach, *Congressional Reform in the Seventies* (Morristown, NJ: General Learning Publishing, 1977).

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## Remarks of Roger Herdman, OTA Director

*September 29, 1995*

Dear Colleague:

In 1972 the U.S. Congress, recognizing the importance for responsible legislating of unbiased expert information and analysis of major science and technology issues, established, by the enactment of Public Law 92-484, the Office of Technology Assessment (OTA), an agency of the Legislative Branch. In the 23 years that followed, OTA developed an experienced and knowledgeable professional scientific staff and, with the help of thousands of national and international experts and stakeholders, created a process, a culture, and a body of work in response to requests from Congressional Committees and OTA's bipartisan, bicameral Board of 12 Senators and Representatives.

The 104th Congress chose not to fund OTA's work after September 30, 1995. As an important final responsibility, the management and staff of OTA undertook making available widely and in easily accessible form as complete a collection as possible of

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# Technology Assessment and the Work of Congress

OTA's formal reports to Congress. Not included in this collection are testimony, various memos and letters responding to informal questions, administrative reports and the like. The material presented here forms an historical archive, evidence of the evolution of OTA's process, agenda and staff achievements, a collection of useful data, analyses, conclusions and options and a record of congressional interests. It also witnesses the value of a unique experiment of the United States Congress.

*Roger C. Herdman*
*Director of the Office of Technology Assessment*





## In Memoriam: The Office of Technology Assessment, 1972-95

*Hon. Amo Houghton in the House of Representatives*
*Congressional Record, Extension of Remarks - September 28, 1995, Page E1868-187*

Mr. Speaker, the Congressional Office of Technology Assessment [OTA], which served the Congress with such great distinction for more than 20 years, will close its doors on September 29, 1995. On behalf of all the Members of this body, I would like to express my deep appreciation to the more than 200 dedicated and talented individuals at OTA who have served us so selflessly. And I want to share with you a brief summary of their accomplishments.

As you know, OTA's job was to provide the Congress with an objective, thorough analysis of many of the critical technical issues of the day. And that it did, examining cutting edge science in medicine, telecommunications, agriculture, materials, transportation, defense, indeed in every discipline and sector important to the United States. The agency appraised the costs and benefits of diverse technological systems: The computerization plans of Federal agencies; satellite and space systems; methods for managing

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natural resources; systems for disposing of wastes. The list is endless. But to mention just a few more:

OTA evaluated the environmental impacts of technology and estimated the economic and social impacts of rapid technological change. The agency offered sound principles for coping with, reaping the benefits of, that technological change—in industry, in the Federal Government, in the work-place, and in our schools. The agency took on controversial subjects, examining them objectively and comprehensively for our benefit. It helped us to better understand complex technical issues by tailoring reports for legislative users. It provided us with early warnings on technology's impacts and it enabled us to better oversee the science and technology programs within the Federal establishment.

While pulling issues down to practical grounds, OTA has usually erred on the optimistic side. For example, OTA regularly spelled out its belief in the power of technology to improve our lives and help solve the Nation's problems. It worked through a basic understanding of how technology works, how institutions need to change to accommodate new technology, how resistant to change such institutions can be when the conditions are wrong, and how swiftly they can adapt when the conditions are right. OTA helped us discover the conditions for change.



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# Technology Assessment and the Work of Congress

Once OTA was well underway, it had 30-60 projects in progress, published up to 55 reports, and started approximately 20 new projects each year. Its work ran the gamut of subject matter, with approaches tailored for each topic and congressional request. For example:

- In 1975, one OTA program began a comprehensive policy analysis of the Nation's energy future, which it provided incrementally throughout the energy crisis.

- Between 1975 and 1980, another OTA group set the stage for today's booming industry in the technology assessment of health care by demonstrating the inadequacy of information on which decisions about technology were made; laying out the strengths and weaknesses of methods to evaluate technology; and crystallizing the process by which economic tradeoffs could be incorporated in decisions.

- In 1979, OTA expanded its work in agriculture to include all renewable resources and laid the foundation for others' efforts on sustainable

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# TECHNOLOGY ASSESSMENT AND THE WORK OF CONGRESS

development and, later, ecosystem management.

- One OTA group examined each key mode of transportation in turn, focusing especially on urban transportation; better and less expensive ways to move goods; and technologies which used less petroleum. Another OTA program tracked materials through their total life-cycle—from exploration and extraction through production to use, reuse, and eventual disposal. A third investigated policies related to the private use of Federal public lands and other resources, addressing questions of public equity, the responsibility of industry, and the long-term protection of the environment.

In sum, OTA brought new and important science into the center of many congressional discussions. At times, OTA took part in high-profile debates on major pieces of legislation such as the 1980 Energy Security Act; Superfund; the Clean Air Act; and the Foreign Assistance Act. Also, the agency contributed to specific technical issues that puzzled nontechnical congressional staff—from risk reform to long-term African development; from acid rain to dismantling nuclear weapons; from the Strategic Defense Initiative to police body armor. One study on global climate change helped Congress evaluate more

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# Technology Assessment and the Work of Congress

than 131 pieces of legislation. At its busiest, OTA's testimony for various committees averaged more than once a week.

The executive branch and State governments were not outside the OTA reach. OTA published the landmark work on computers in schools. This eventually led to support for teachers as the way to make the best investment in technology—a key policy change in education. OTA's repeated work on the farm bill prompted important changes in the U.S. Department of Agriculture. And OTA's comprehensive series of analyses on nuclear waste management set out issues of technology and policy for both industry and the military.

In the course of every study, OTA accumulated vast amounts of raw information. By a project's completion, OTA had created a report with "value-added." OTA staff excelled at identifying the principal strands of analysis, weighing the evidence of each, and synthesizing essential pieces. The creed of OTA was to come as close as possible to objective analysis. It was a point of pride when reports were cited both by an issue's defenders and its detractors, as happened most recently in debates regarding the North American Free Trade Agreement and Oregon's Medicaid program.

The public and private sectors have recently discovered the benefits of organizing work around functional teams. OTA started with this model. It was used in every project. Team members came from different disciplines and backgrounds, with different experiences

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and perspectives, yet they always seemed to share a commitment to their product and not incidentally to the American people.

When work took OTA into new subject areas, staff broke ground for new intellectual pursuits. This was true in risk policy. And it was true when OTA developed the analytical methods to identify priorities for agricultural conservation. During OTA's lifetime, "international interdependence" changed from slogan to reality. OTA was ahead of the curve, conducting international case studies and exploring previously ignored aspects of international security. In fact, between 1985 and 1990, OTA's studies of the impacts of technology on the economy, environment, and security of the U.S.S.R. and Eastern Europe made clear that the demise of centrally planned economies was inevitable.

As a result of all this, OTA gradually became recognized worldwide as the top institution of its kind. Representatives from about one-third of the world's nations visited OTA one or more times to learn how OTA worked; how it became so valuable to Congress and the American people; and how these foreign nations might develop their own "OTA's." Austria, Denmark, the European Community, France, Germany, Great Britain, the Netherlands, and Sweden have copied or adapted the OTA style. Similar organizations are

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being discussed or formed in Hungary, Japan, Mexico, the People's Republic of China, Russia, Switzerland, and Taiwan.

The above is simply the most visible aspect of OTA's international impact. Visitors from other countries stopped by OTA almost every week to discuss specific technologies or technology-related issues. Several OTA staff spoke frequently about OTA in other countries. A number accepted temporary details to academic or government positions overseas. And still others traveled abroad to teach short courses on technology assessment.

In its 24 years, OTA published nearly 750 full assessments, background papers, technical memoranda, case studies, and workshop proceedings. OTA reports were recorded as being "remarkably useful," "thorough," "comprehensive," "rigorous." At their best, OTA reports were among the most cited references on their subjects. "Landmarks," they were called, "definitive," and the "best available primers." From 1992 to 1994, twelve assessments won the National Association for Government Communicator's prestigious Blue Pencil Award, successfully competing against as many as 850 other publications in a single year. In the same 3 years, 12 additional reports were named among the 60 Notable Government Documents selected annually by the American Library Association's Government Documents Round Table—representing the best Federal, State, and local govern-

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# Technology Assessment and the Work of Congress

ment documents from around the world.

In typical comments, the journal Foreign Affairs claimed that, "The Office of Technology Assessment does some of the best writing on security-related technical issues in the United States." A former Deputy U.S. Trade Representative called OTA's 1992 report on trade and the environment, "the Bible." A Senator described OTA's work on the civilian impacts of defense downsizing as "… a superb study and the standard by which all similar efforts will be judged." And the head of one state's plant protection agency described OTA's study of non-indigenous species as "… a benchmark which will be the most heavily referenced document for years to come."

OTA's reports were often best-sellers at the Government Printing Office and the National Technical Information Service: GPO sold 48,000 OTA reports in 1980 alone. Commercial publishers reprinted at least 65 and translated two reports all or in part. The Superintendent of Documents selected 27 OTA reports to display in the People's Republic of China in 1981. And OTA itself reissued reports that had unusual staying power. For example, OTA's 1975 report on tanker safety and the prevention of oil spills was reissued in 1990 after the Exxon Valdez accident. Likewise, OTA combined the summaries of two particularly popular reports—on tropical forests and biological diversity—and reprinted them in 1992.

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# Technology Assessment and the Work of Congress

OTA staff represented every major field of science and technology, ranging from board-certified internists to Ph.D. physicists. OTA staff were sought out to serve their respective professional associations. A number were elected to offices or boards—the International Society for Technology Assessment, the International Association for Impact Assessment, the Association for Women in Development, the Ecological Society of America, etc. Two staff formed the Risk Assessment and Policy Association and others went on to found their own companies.

Above all else, OTA staff were teachers. As a result of their efforts, hundreds of thousands of people are better informed not only about science and technology but also about the structure and function of Congress. OTA served 30-60 congressional committees and subcommittees each year. Thirty-one Senators and Representatives had the privilege to serve on OTA's Technology Assessment Board and we became among the Congress' most knowledgeable members on issues of science and technology.

Each year, at least several hundred advisory panelists and workshop participants also took part in OTA's work. Some years, OTA tapped as many as 1,500 leaders from academia, non-governmental groups, State and local governments, and industry. OTA's advisors valued the experience and said it made them more fit for decisionmaking in their own fields. Some were experts; some were stakeholders. Still other were members of the

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larger public. As early as 1975, OTA incorporated public participation and stakeholder involvement into a major study of offshore energy development: Nearly 15,000 people were involved. Later approximately 800 African farmers and herders were included in an evaluation of the United States-funded African Development Foundation.

In addition, OTA provided 71 scientists and engineers with a challenging and memorable year on Capitol Hill as Morris K. Udall Congressional Fellows or congressional fellows in health policy. Many of OTA's younger employees gained a taste for research—and for public service—at OTA and went on to graduate school to become the next generation of business leaders, scientists, engineers, and policy analysts.

OTA's record depended upon remarkable support staff as much as it did on the agency's analytical staff. Their work was the standard against which other Government agencies were measured—and often found lacking. People came from around the world to attend OTA meetings—and often commented that OTA's workshops were the most well supported, best organized, and most productive they had ever attended. Contractors were gratified by the ease with which their travel arrangements and invoices were handled. OTA processed hundreds of security clearances efficiently and without incident—without which OTA could not have done its work in national defense. Reports sped through OTA's publishing process and grew steadily more attractive through the years.

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# Technology Assessment and the Work of Congress

The staff of OTA's Information Center could find even the most obscure research material—and provided a friendly agencywide gathering place. The Information Center, the technical support office, and the agency's electronic dissemination program kept OTA at the cutting edge of technology for research and for public access to the agency's work.

OTA was a small agency. It was a generous place. For some, colleagues became like second families and these relationships extended to committee and personal staffs. Friendship, joy, and grief seemed to be shared without regard to job description. Many at OTA value this legacy as much as any other. But of course, OTA was not perfect. At times, its greatest strengths—flexibility, tolerance, the preponderance of technical skills—became its biggest weaknesses. One outsider looked at OTA's work and commented, "You must have just about the most interesting job there is." I know that many at OTA, for much of their time, felt exactly that way.

Although OTA closes on September 29, 1995, the Congress will continue to benefit from its work. Stark evidence of the dedication of OTA staff is the fact that they continued working to the end. More than 30 reports will be delivered to requesting committees even after the doors are closed.

OTA soon will be a memory, and we will discover what is lost. But we can salvage something. Those of us who have used OTA reports know that most of them have long

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shelf lives. The really important issues—the issues OTA worked on—do not get solved and go away in one Congress. In January 1996, all of OTA's reports will be issued on CD-ROM—OTA's final legacy. We should be proud of it.



*Amo Houghton, a Republican, represents the 31st Congressional District of New York.*



# Technology Assessment No Longer Theoretical

*by James H. Krieger*
*Technology Editor*
*Chemical and Engineering News*
*April 6, 1970*

Technology assessment is no longer just a speculative concept. Perhaps sooner than many had expected, it could be on the verge of institutionalization. The concept has been embodied in a specific bill which will soon be introduced by Congressman Emilio Q. Daddario (D.-Conn.) in the House of Representatives (C&EN, March 30, 1970, p. 27).

The bill will be something concrete to which involved persons can now respond. The problem may be one of reaching all those who should be involved but who are perhaps unaware that they are—particularly industry.

As drafted, the bill would establish an Office of Technology Assessment to aid Congress in identifying and considering existing and probable impacts of technological application. OTA would consist of a technology assessment board to formulate policies of the office and a director to carry them out and to administer the operation. The board

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would be made up of 13 members—two senators, two representatives, the Comptroller General, the director of the Legislative Reference Service of the Library of Congress, and seven members from the public. The last would be persons eminent in one or more fields of science or engineering or experienced in administering technological activities. The director of OTA would be equivalent in rank to the chairman of the Atomic Energy Commission or the director of the National Science Foundation.

The bill as drafted asks $5 million for OTA for the first fiscal year. OTA would not itself operate any laboratories, pilot plants, or test facilities, but would contract with other organizations for whatever it feels is necessary.

The bill leaves no question as to why technology assessment is considered a necessary activity. It notes that emergent national problems—physical, biological, and social—are of such a nature and are developing at such an unprecedented rate as to constitute a major threat to the security and general welfare of the United States. Such problems, it says, are largely the result of and are allied to the increasing pressure of population, the rapid consumption of natural resources, and the deterioration of the natural and social human environment. The growth in scale and extent of technological application, it continues, is a crucial element in such problems and either is or can be a pivotal influence with respect both to their causes and their solutions.

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# Technology Assessment and the Work of Congress

No one can know at this point what technology would be assessed. Some would undoubtedly relate to government programs. But it isn't difficult to imagine that much of it would be technology either initiated or carried out by industry. Much would be chemical technology or would directly or indirectly affect chemicals or chemical products.

Suppose that technology assessment had been an operational concept, say, 20 years ago. Suppose also that something like today's solid waste problem had been foreseen, and that packaging technology had been the subject of assessment. It is interesting to speculate on the direction that plastic and nonplastic packaging would have taken.

This may seem a somewhat trivial example beside some of the potential problem areas now developing—genetic engineering or weather modification, for example. But it does serve to show that industry must become involved, whether or not the particular bill about to be introduced passes. If not this bill, then something similar will be passed eventually. If not this year, then next. It would be beneficial to the entire process of technology assessment if industry would adopt some positive role at the start, rather than responding later as an offended or regulated party when legislation based at least in part on technology assessment results.

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## The Debate Over Assessing Technology

***Congress Wants To Set Up an Office To Evaluate the Impact of New Developments***

*Business Week*
*April 8, 1972*

Quietly making its way through Congress is a bill that would create an Office of Technology Assessment to determine for Congress the byproduct effects of new technology. Many businessmen and scientists are not even aware of the bill's existence, and most of those who do know about it have no clear idea of what role the new office would play. But among these last there is an increasing fear that an OTA could have a sharp and negative impact on technological development in the U.S.—and on industry's pocketbook.

The chances that Congress will approve the bill seem excellent. It has already passed the House, and the Senate is expected to approve its version in the next few weeks. There has been little controversy over it in either chamber. Many senators and representatives seem to feel that they need expert and unbiased advice before they approve programs that call for spending millions of dollars for technological advances that may have unknown

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# Technology Assessment and the Work of Congress

side effects.

But outside Congress, there is growing skepticism that any formal organization can properly evaluate the impact of technological change on the environment, the economy, and society. Says Daniel E. Noble, retired vice-chairman of Motorola, Inc., and now head of the company's Science Advisory Board: "If such an office is expected to anticipate the impact of science and engineering over the long term, this is absurd." And William O. Baker, vice-president for research and patents at Bell Labs, says: "I don't know where you'd start in the course of innovation to make technology assessments.... You could only be sure to restrain technical progress."

## *Need*

Some of the fears expressed arise because it is still far from clear how a Congressionally established Office of Technology Assessment would operate. Arthur M. Bueche, General Electric's vice-president for research and development, would not mind an office that functioned as "an information activity for members of Congress." But he warns that if the OTA were to be set up as "a police activity, it would stifle innovation." And Robert Anderson, president of North American Rockwell Corp., says he would "hate to see a super group" evolve.

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# Technology Assessment and the Work of Congress

Congress now gets a form of technology assessment from the National Research Council, but these studies usually do not attempt to explore the byproduct effects of any particular program. And some congressmen question the NRC's impartiality because the council also works for the executive branch. For instance, Senator Thomas F. Eagleton (D.-Mo.) recently derided an NRC study—which concluded that the technology necessary to meet the 1976 standards for auto exhaust emissions is not currently available—as being the result of "a nice admiration society" between scientists and industry.

Former Congressman Emilio Q. Daddario of Connecticut, who led early efforts to establish a technology assessment office, says that the bitter and confused debate over the supersonic transport could have been avoided if Congress had had an OTA to help it. One key issue, he recalls, was the charge that SST engine emissions could cause skin cancer in humans by upsetting natural radiation filtering mechanisms in the atmosphere. But because the charge came from opponents of the SST among environmentalist groups, it lost much credibility. Similarly, arguments that overseas sales of the SST would help the balance of payments had little effect because they came from strong SST advocates in the Administration.

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# Technology Assessment and the Work of Congress

*Costs*

Those businessmen worried about the added costs to industry of technology assessment have the recent example of the study of the Alaska pipeline's environmental impact to confirm their fears. The study delayed the start of construction for two years, and Alyeska Pipeline Service Co. is expected to have to pay the $9 million it cost the Interior Dept. to make it.

But Joseph Coates, a program director of the National Science Foundation, thinks industry's fears are unfounded. Says he: "We're committing ourselves to spending enormous sums on technological projects, so we can't afford to play the planning game by ear."

Businessmen "might panic" over technology assessment and "take it to mean technology arrestment," Coates says. "But stopping an already-committed project is the least likely consequence." Technology assessment, he believes, "would steer an already-committed project to produce the least adverse consequence."

*House version*

Though there has been little argument over the bill in Congress, it has gone through some changes in the last few months. The bill passed by the House in February is a watered-

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# Technology Assessment and the Work of Congress

down version of the one reported out of the House subcommittee on science, research, and development. Representative John W. Davis (D.-Ga.), subcommittee chairman and chief sponsor of the bill, wanted a stronger and more independent OTA, with public representatives on its board and a director who could start assessments on his own and subpoena testimony and records.

This went too far for Representative Jack Brooks (D.-Tex.). Such an office, he says, "set up apart from the Congressional process and possibly working in opposition to the committees in Congress, could delay or jeopardize the improvement of information resources." His amendment changed the OTA board to one made up solely of members of Congress with complete control over the director. It also eliminated the OTA's subpoena powers and its authority to initiate assessments.

Under the House bill, the OTA's 50 to 100 professional "assessors" would make their studies only at the request of Congressional committees. Their job would be to spot impacts of technology, establish "cause-and-effect relationships," determine alternative technological methods of implementing programs, and estimate and compare the impacts of these alternatives.

In this form, OTA would be much like a joint Congressional committee, less innovative than the original office and subject to more political pressures. But the Senate may add

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some changes of its own. It may, for instance, decide to include an advisory panel of outside experts to assist the board.

### *Serving the public*

There are some who doubt that an OTA will work the way Congress wants it to. Technology assessment is now an "in" concept, but, they point out, it is far from being a practical tool. Says Edward E. David, Jr., White House Science Adviser: "The assessment process is in a very primitive state."

David claims that more research is needed if assessments are to be better than simple seat-of-the-pants judgments. But he agrees that "we must develop the techniques necessary for assuring the public that its concerns are being duly considered."

Increasing public pressure for such assurance is part of the reason Congress wants its own independent advisers. Congress could place "more faith and trust" in OTA than it can in existing sources, which have "built-in biases and prejudices whether they be industry or government agencies," says Robert N. Faiman, vice-provost at the University of New Hampshire, who testified in favor of the bill.

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# Technology Assessment and the Work of Congress

*The right to assess*

But to gain influence, the technology assessors would have to establish their credentials with the main committees of Congress, and most of the committees are likely to prove jealous of their power to assess legislation on their own. For instance, Sidney L. McFarland, staff director of the House Interior Committee, says: "I don't foresee much interplay between our committee and an OTA. We already have highly qualified staff members who can analyze programs proposed by the agencies."

And finding a staff that can make competent assessments may be difficult. At least half a dozen schools offer courses in technology assessment, but there is no generally accepted definition of a "technological assessor," nor any agreement on whether he should be a systems analyst, an operations researcher, a physicist, or a sociologist. Says the NSF's Coates: "It isn't a question whether the field will be invaded by phonies. It already has been."

Philip Handler, president of the National Academy of Sciences, is not so worried about such problems. "Technology assessments," he says, "have been going on for quite a long time." Regulatory agencies, such as the Food & Drug Administration, the Environmental Protection Agency, and the Federal Trade Commission, have been forced into assessments because of their mission, he points out. And the NSF itself is financing assessments

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of such diverse developments as offshore oil production, no-fault insurance, and cloud-seeding programs.

The House bill calls for using the NSF as a study contractor for the OTA. But this could be ruled out in the Senate bill. Some congressmen feel that OTA should have no close ties with executive branch agencies.

If the OTA bill passes, as seems likely, the Administration may have to sort out the science advisory groups in some 115 federal agencies and offices that now make technology assessments. Says Gabor Strasser, who spent two years at the White House Office of Science & Technology studying assessment procedures: “When an agency goes before Congress to justify spending for new technology, it will have to have answers for the OTA director.”

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## O.T.A. Caught in Partisan Crossfire

*by Colin Norman*
*Technology Review*
*October/November 1977*

The Office of Technology Assessment (OTA) has endured a long, hot summer, and the autumn may not bring much relief. Since it was established in 1973 to provide Congress with analyses of technical issues, OTA has been criticized for a variety of sins of omission and commission. But during the past few months, the Office has been turned into a battleground for partisan politics. Though the dispute has been concerned more with the style of OTA's operation than with the quality of work, a few serious questions are being raised about the Office's future role and responsibilities.

The trouble began when Emilio Q. Daddario, OTA's founder and for the past three and a half years its Director, announced his intention to resign. Dr. Daddario had long said that he intended to stay at OTA only long enough to get the Office under way, and his resignation should have evoked neither undue surprise nor cries of foul deeds. Nevertheless, a few days after the announcement, William Safire—a former speechwriter for

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# Technology Assessment and the Work of Congress

Richard Nixon, now a conservative columnist for the New York Times—wrote a column claiming that Dr. Daddario had been ousted by Senator Edward Kennedy (D.-Mass.), Chairman of OTA's Congressional Governing Board. The move, said Mr. Safire, was prelude to an attempt by Senator Kennedy to "take over" OTA. Mr. Safire said Senator Kennedy planned to install his own aide, Ellis Mottur, in the Director's chair and would then use OTA as an extension of his personal staff.

The source of those allegations, it turned out, was Representative Marjorie Holt, a conservative Republican from Maryland who was Vice Chairman of OTA's Governing Board. Within a week of Dr. Daddario's resignation, Representative Holt also quit, firing off a letter to Senator Kennedy saying that she could no longer have any influence on OTA's policies because the Board was so dominated by Senator Kennedy and his allies.

A week later another member of OTA's Congressional Board, Senator Richard Schweiker (R.-Penn.), also resigned. Senator Schweiker said he was quitting simply because his other Senatorial duties had grown and he no longer had time to attend to OTA affairs. Though the move was not inspired by political differences or by concern at the direction OTA is taking, it is nevertheless telling. Senators and Congresspeople are not in the habit of resigning from committees which give them influence or political visibility, and Senator Schweiker evidently felt that the OTA Board provides neither of those attributes.

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# Technology Assessment and the Work of Congress

The third blow fell late in July, when a conference committee finally agreed on a budget bill for the Legislative Branch for fiscal year 1978. The bill included a cut of about $1.6 million in the budget requested for OTA, and a decree that the Office's staff should be pruned. OTA will have a budget of just over $7 million next year. The move indicates that OTA has yet to establish its utility to the people who count most on Capitol Hill—the appropriations committees.

## *Timid and Trivial?*

The upsets followed critical reports on OTA last year. The first, from the House Commission on Information and Facilities, said that OTA's internal management was in a mess and there was a good deal of confusion about the Office's role. That was followed by the resignation of Harold Brown, now President Carter's Secretary of Defense, as Chairman of OTA's Advisory Council, an independent body which provides policy advice to the OTA Board and Director. In his letter of resignation, Mr. Brown offered some words of praise for OTA, but suggested that it had become bogged down in trivial studies and had neglected its primary role of providing Congress with an early warning system on the potential side effects of new technology. In addition, there has been some carping from outside OTA to the effect that the Office has been too timid in its choice of issues and that

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# Technology Assessment and the Work of Congress

it has really been providing policy analysis instead of technology assessment.

Before examining those complaints, it is worth reviewing the origins of OTA and its goals.

OTA sprang from discussions in the mid-1960s between Dr. Daddario, then a Congressman from Connecticut and Chairman of the Subcommittee on Science, Research and Technology, and a number of scientists including Jerome Wiesner, President of M.I.T. The basic idea was that Congress lacked the technical expertise to match the Executive Branch on technological issues, and a body to provide technical advice to legislative committees was badly needed. Dr. Daddario translated the idea into legislation, and Congress eventually approved a bill establishing OTA in 1973. By that time, Dr. Daddario had left Congress to make a bid for the Governorship of Connecticut, and he was named the first Director of OTA.

The legislation decreed that OTA should be managed by a Congressional Board consisting of six Senators and six Representatives, with equal numbers of Republicans and Democrats. Senator Kennedy was elected the Board's first Chairman; he was followed by Olin Teague, Chairman of the House Committee on Science and Technology, and the chairmanship reverted back to Senator Kennedy earlier this year. In addition, the legislation established an independent Advisory Council to provide policy advice for OTA.

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# Technology Assessment and the Work of Congress

When Harold Brown resigned from the Council last year, Dr. Wiesner was elected Chairman.

So much for the organizational arrangements. What was OTA supposed to be doing? OTA is a creature of the Congress; it was established to provide advice to Congressional committees when asked, and it must tailor its product to fit the requirements of legislators. This immediately raises a problem, for Congress is usually concerned with immediate issues, and requires quick answers, while OTA is supposed to take a long-term view. It is therefore not surprising that much of OTA's work has consisted of relatively straightforward policy analysis tied to specific pieces of legislation.

In fact, some of OTA's most widely praised studies have not been technology assessments, according to a strict definition of the term. OTA put together some quick analyses of the Ford and Carter administrations' energy policies which have been credited with eliciting more funds for conservation technologies, for example. It has also produced reports on the bioequivalency of supposedly identical drugs made by different companies, a review of the research and development programs of the Environmental Protection Agency, and a study of computer policies in the Internal Revenue Service. All of those studies were essentially policy analyses but they were the kind of thing that Congress was interested in.

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# Technology Assessment and the Work of Congress

Of the larger studies which conform more closely to technology assessment, only one is significant: a massive investigation of the consequences of expanding offshore oil production along the Atlantic coast, a study which involved considerable public input, identified many potential problems and issues, and attracted a good deal of attention.

## *Political Spats*

So far, OTA has produced more than 40 reports and, though the office has received a lot of criticism, nobody has taken a good look at the products to see whether they have been influential or of reasonable quality. Two such studies are about to be undertaken. First, OTA's Advisory Council is beginning an investigation of the Office's functions, its impact, and the quality of its work. The study, which was requested by the board at the instigation of Senator Kennedy, has been one of the irritants in the latest round of disputes concerning OTA.

The second study will be conducted by the House Committee on Science and Technology this fall. The Committee is planning a series of public hearings at which some of OTA's critics, including Representative Holt, are expected to testify. The objective, according to committee staff, is simply to review OTA's record so far, but it is likely to provide a public forum for some of OTA's critics.

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# Technology Assessment and the Work of Congress

And that brings us to the latest charges that Senator Kennedy is trying to take over OTA. Way back in 1973, when OTA was just organized, an article appeared in the Wall Street Journal suggesting that Senator Kennedy was about to use OTA to build up his power base for the 1976 Presidential election. Should the latest accusations be given any more credence?

Senator Kennedy certainly dominates OTA's Congressional Board. His views usually carry the day, and on the few occasions when there has been a vote on a major question, the majority has sided with Senator Kennedy while the dissenters have been Representative Holt, her two fellow House Republicans, and Olin Teague. One reason why Senator Kennedy has been so influential is that he is perhaps the most active and interested member of OTA's Board (witness, for example, Senator Schweiker's statement that he no longer has time for OTA affairs). But Senator Kennedy's critics charge that his influence stems chiefly from another source: he has some of his own staff aides working for OTA, and he has close connections with Dr. Wiesner.

In fact, most of the Senate members of the OTA Board has some of their own staff aides working for OTA, a situation which has raised complaints from a few other OTA officials, who see the political appointees as inconsistent with OTA's supposedly nonpartisan role. As for the complaints about the link between Senator Kennedy and Dr.

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Wiesner, Dr. Wiesner was not appointed by Kennedy (contrary to some published accounts), but was elected by other council members. The election, moreover, took place when Representative Teague, not Senator Kennedy, was Chairman of OTA's Board

Another possible reason for the dispute over Senator Kennedy' role is pure partisan politics. Senator Kennedy, a liberal Democrat, is always a prime target for conservative Republicans, and this case is no exception.

Representative Holt's resignation followed three differences of opinion with Senator Kennedy on OTA's Board. The first concerned a vacancy on the Advisory Committee. J. Fred Bucy, an executive of Texas Instruments, was up for reappointment to the Council but Senator Kennedy objected, criticizing Mr. Bucy's record of attendance during his first term of office. Representative Holt charged that Senator Kennedy's objections stemmed from differences of opinion on several matters of policy. The second irritant was Senator Kennedy's proposal that the Advisory Council should conduct a review of OTA's operations, a review which Representative Holt believed would be biased because of the Council's alleged close links with Senator Kennedy. And third, Representative Holt objected to Senator Kennedy's proposal that OTA should do a quick study of the data which led to the proposed ban on saccharin. Representative Holt said that the review would add nothing to the debate and charged that Senator Kennedy only wanted a study

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which would support his own position. Representative Holt was defeated on all three issues, and subsequently resigned from the Board.

All of these spats mask the central question about OTA: is it performing useful functions, and is it having any impact on congressional operations? OTA staffers point to a sack of press clippings and comments from members of Congress praising its work, but there are few issues on which OTA can claim to have had decisive influence. The reviews by the Advisory Council and the House Committee on Science and Technology should, however, provide some real information on the quality and impact of OTA's operations—though there is also the danger that the House Committee hearings may degenerate to yet another exchange of partisan rhetoric.

Meanwhile, a replacement for Dr. Daddario as Director of OTA is being sought, and an appointment is expected soon.

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*Colin Norman is a Research Associate at Worldwatch Institute. He was Washington correspondent for Nature and is a regular contributor to Technology Review.*

# Little-Known Agency Draws Worldwide Interest

*by David Burnham*
*New York Times*
*January 12, 1984*

WASHINGTON, D.C.—A tiny Federal agency with an extraordinary mandate has become a powerful magnet for government officials from all over the world.

In just the last year, for example, more than 100 visitors have come to Washington from 25 countries including China, France, Indonesia, Denmark, Egypt, Britain, Brazil and Australia to find out how the agency works and what it produces.

The focus of all this international interest is an agency that is largely unknown to the American people, the Office of Technology Assessment. Created over 10 years ago as an arm of Congress, it was given the difficult assignment of trying to anticipate, understand and describe how the world's new technologies will effect the people, environment and institutions of the United States.

In a world where dozens of powerful new chemicals, startling scientific discoveries, far-reaching computer systems, earth-shattering weapons and potent drugs present diffi-

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cult new social problems on almost a weekly basis, the challenge of this job is a major one, apparently of interest to both the democracies and the authoritarian states. The head of the agency, Dr. John H. Gibbons, visited the Soviet Academy of Sciences last spring to describe his agency's work.

## *Pressures From Congress*

Dr. Gibbons is a 55-year-old physicist who has specialized in energy and environmental issues. With a permanent staff of 139 people and a $14.6 million budget that enables the agency to hire some 2,000 outside experts a year to work on special projects, Dr. Gibbons is generally credited with guiding the agency out of difficult waters in its first few years, when it was buffeted by political pressures from Congress.

"The problem is to keep the agency relevant to the political process but avoid partisan biases," he said. "Our process of tapping national wisdom, stripped of bias and advocacy, has begun to make its mark."

While many of the reports prepared by the OTA in the last few years have won wide praise, some critics doubt the agency's work has much effect on the policy decisions made by the Federal Government on such volatile and complex subjects as acid rain, the financing of new missile systems and improving the performance of the nation's schools.

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# Technology Assessment and the Work of Congress

"The need is not for more seers and forecasters," said Lawrence Tribe, a professor at Harvard Law School, one of the early advocates of technology assessment. "The real problem is to find ways to make such advice more salient."

Professor Tribe contended in an interview that the principle problem with OTA was outside its control. "I think that to be effective, there would have to be a similar effort in the executive branch," he said. "Unfortunately, however, the last two or three administrations have gradually dismantled and politicized the scientific advisory machinery at the White House level so that the Congressional effort seems to make relatively little difference."

Representative George E. Brown Jr., Democrat of California who is a member of the agency's board, has a different concern. "There is no question that the office has escaped the controversy of its earlier years and is now providing Congress with useful material, a distillation of the best knowledge on a subject and a list of policy options that Congress might adopt," he said. "But I am not sure that that is what we require, that rather than possible options, we need clear strategic advice."

A brief description of some of the agency's recent publications suggest the wide range of its concern. At the request of the Senate Committee on Foreign Relations, for example, the agency prepared a 151-page study, "The Effects of Nuclear War," which described the

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# Technology Assessment and the Work of Congress

estimated casualties and destruction that would result from the explosion of nuclear bombs at various altitudes over Detroit and Leningrad. This authoritative study has become one of the agency's most requested reports.

In a second study, undertaken for the House Committee on Education and Labor, the staff and consultants of the OTA analyzed "Information Technology and its Impact on American Education," describing the advantages and disadvantages of various possible actions Congress might consider in this area to improve the performance of the nation's schools and their students.

At the request of several Congressional committees, the agency prepared a 331-page report entitled "Impacts of Applied Genetics." It described the process and potential effects of man's rapidly increasing ability to manipulate the inherited characteristics of plants, animals and microorganisms.

In the agency's history, according to several staff members and others who have followed its history, the OTA has gone through several phases. At the beginning, under a former Connecticut Congressman, Emilio Q. Daddario, many of the staff members worked almost directly for the Senators and House members who served on the agency's board, and most of its projects were directly related to the political needs or these members.

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*Early Days of Criticism*

Then, Russell Peterson, a highly regarded industrial scientist who now is the president of the National Audubon Society, became the head of OTA. Mr. Peterson won the right to have complete control of staff appointments. But he ran into criticism from Congress because he tended to ignore requests for help on immediate problems and concentrate all of the agency's research on long-term projects.

Dr. Gibbons, it is generally agreed, has retained the right to hire his own staff while at the same time becoming somewhat more responsive to the demands of Congressional committees for assistance on immediate problems.

"OTA is doing good, sometimes excellent work," said Frank Press, the current head of the National Science Academy, a nonprofit organization that earns most its keep doing similar kinds of research for executive branch agencies such as the Energy Department. "The only reservation I have is that it has become too popular with Congress and is not able to devote enough of its time to looking further into the future at the very large technical questions."

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# OTA Emerges as Nonpartisan Player

***Surviving a Rocky Start, Science Agency Wins Over Most Skeptics***

*by Barton Reppert*
*Associated Press*
*Washington Post*
*January 5, 1988*

Politicians usually aren't scientists and they're often stumped by political questions with scientific dimensions—such as whether to build a supersonic transport, ban DDT or get behind solar energy.

Fifteen years ago, to help with such questions, Congress created a tiny agency, by Washington standards—the Office of Technology Assessment.

Conservatives were wary. Some saw it as a shadow brain trust for an ambitious Sen. Edward M. Kennedy (D.–Mass.), one of the first to argue that Congress needed its own science adviser. But now, OTA has largely overcome those suspicions and won a role as a dispassionate, nonpartisan player in the legislative process.

OTA has issued authoritative research on issues ranging from health care policy and

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# Technology Assessment and the Work of Congress

advanced computer technology to the feasibility of President Reagan's Strategic Defense Initiative missile defense system.

It has looked into electronic surveillance, genetic engineering, use of lie detector machines and the management of hazardous waste.

John H. Gibbons, 58, a physicist and environmental specialist who has headed the agency since 1979, foresees an increasing demand for his agency's analytical talents.

"Technology as it influences international trade, national defense, environment, our economic growth and progress, health care—all the way across the board, those problems are going to get more vexing, not less vexing, in the years ahead," Gibbons said in an interview.

OTA remains the smallest of the agencies Congress has created for its guidance. Its sister agencies include the General Accounting Office, which conducts investigations of government programs to help Congress in its oversight role; the Congressional Budget Office, which performs economic analysis; and the Congressional Research Service of the Library of Congress, which answers inquiries from Congress on many nontechnical issues and does not hire outside experts.

"We have learned that there are big advantages in being small," Gibbons said. "If you're created to be small in size, you are constantly forced to the outside to get your

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# Technology Assessment and the Work of Congress

information."

With 145 people and a budget of $16.6 million, OTA conducts about 30 assessments at a time, beginning between 15 and 20 new projects every year.

Full-scale assessments—involving use of outside specialists, convening of advisory panels and an intensive review process—take about 18 months and result in a report typically running 300 pages or longer.

The agency is housed in a five-story colonial-style building a 10-minute walk from the Capitol. "A few blocks away is just about right," Gibbons observed. "It keeps you removed from the daily fire fights but close enough to be part of the process."

OTA strives to argue all sides of an issue, providing a variety of policy options for Congress. John P. Andelin Jr., an assistant director, said, "Essentially our work is laying out intellectual road maps."

Overseeing OTA is the Technology Assessment board, a 12-member bipartisan panel of senators and House members headed by Rep. Morris K. Udall (D.–Ariz.). A member of the board, Rep. George E. Brown Jr. (D.–Calif.) said, "OTA has acquired a real reputation for quality performance, and its products are being used very widely."

He said the fact that OTA reports try to present all points of view "is both a strength and a weakness."

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# Technology Assessment and the Work of Congress

"From my standpoint I think there should at least be the opportunity for OTA to make a recommendation for what is the best policy option under the given circumstances," Brown said. "I think we ought to move in that direction."

OTA recently found it is capable of stirring up controversy. Advocates of unorthodox therapies for cancer charged that the agency is bungling a study of unusual cancer treatments. They said that the OTA official in charge is likely to be biased because of his previous experience at Memorial Sloan-Kettering Cancer Center in New York, a bastion of conventional cancer treatment. Gibbons disputed that charge.

Leading up to the establishment of OTA were years of frustration in a Congress trying to come to grips with technology issues—among them nuclear weapons testing, DDT and other pesticides and the U.S. supersonic transport.

According to Gibbons, "Making decisions involving technology was just getting tougher because there's no free lunch out there. There's nothing that has all gain."

OTA's early years were rocky amid allegations that the agency's secret agenda was to further Kennedy's political ambitions. He was the first chairman of the congressional board. There also were suspicions that OTA would have an antitechnology bias.

"A lot of people were very concerned that OTA might come in and be a naysayer on technology," Gibbons said. "I think that was a particular concern of the conservatives. But

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# Technology Assessment and the Work of Congress

I think that concern has been essentially allayed."

He observed, "We enjoy a lot of support from the conservatives now and from the business community, because they see the place not as negative about technology but essentially technology neutral. We're full of technologists, we have a lot of technological optimists."

Born on the eve of the 1973 Arab oil embargo, OTA has devoted considerable attention since then to energy issues—among them nuclear power, prospects for discoveries in domestic oil and gas, the federal role in energy research and regulatory intervention in the energy marketplace.

By the early 1980s, however, the agency began moving into other areas, including national security and arms control, where OTA's work has drawn plaudits and sharp criticism.

Peter J. Sharfman, an international security program manager, said that a 1984 paper on ballistic missile defense "stirred up a tremendous amount of controversy."

The paper by Ashton B. Carter, then with the Massachusetts Institute of Technology, concluded: "The prospect that emerging 'Star Wars' technologies, when further developed, will provide a perfect or near-perfect defense system, literally removing from the hands of the Soviet Union the ability to do socially mortal damage to the United States

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with nuclear weapons, is so remote that it should not serve as the basis of public expectation or national policy about ballistic missile defense."

Pentagon officials argued that the paper was technically flawed and asked that it be withdrawn, but OTA stood its ground.

"If you look today at the principal findings, you will discover that they are the conventional wisdom," Sharfman said. "In fact, you will discover that the SDI [Strategic Defense Initiative] Organization would agree with those findings today."

Sen. Ted Stevens (R.-Alaska), vice chairman of the congressional board, remains critical. "I think they wasted a lot of time trying to be the focal point for a lot of dissidents," Stevens said.

He said he was concerned that some OTA studies go too far afield from the agency's charter to analyze technology issues. "When it stays within its assigned area it does a good job," Stevens said, adding: "It's gone beyond the area of technology in some instances and gotten into social policy."

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# Death by Congressional Ignorance

***How the Congressional Office of Technology Assessment—Small and Excellent—was Killed in the Frenzy of Government Downsizing***

*by M. Granger Morgan*
*Pittsburgh Post-Gazette*
*August 2, 1995*

Decision-making is easy if you can ignore the facts and skip the details. Last week the U.S. Congress took a big step toward keeping the pesky facts and details out of its deliberations by closing down its small, but highly acclaimed, Congressional Office of Technology Assessment. Both senators from Pennsylvania, Arlen Specter and Rick Santorum, voted for elimination.

Established by the U.S. Congress in 1972 to provide in-depth technical assessments in support of congressional decision-making, OTA has been overseen by the Technology Assessment Board, a bipartisan committee of six senators and six representatives drawn equally from the two parties.

Because of the political environment in which it has operated, OTA reports rarely draw

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# Technology Assessment and the Work of Congress

definitive conclusions. Rather, in clear and simple language, supported by attractive illustrations, they summarized the technical facts, identified problems, laid out alternatives, and discussed their pros and cons.

The reports often placed limits on the range of political debate by laying out what was scientifically feasible. Legislators on opposite sides of contentious issues have often cited the same OTA report as a basis for the lines of argument they have advanced.

OTA studies, which typically lasted for a year or two, have been performed by a small professional staff of about 140, over half of whom hold doctorate degrees in a variety of fields that include science, engineering and various areas of social science. In addition, to assure balance and completeness, each study was assisted by an advisory board of outsiders who were selected to represent a wide range of knowledge, perspectives and interests. Topics of OTA studies have ranged widely from nuclear proliferation to pollution control, industrial competitiveness, computer security and privacy, and medical technology.

OTA's neutrality and success have been widely acclaimed. The liberal Washington Post has characterized the agency as "a dispassionate, nonpartisan player in the legislative process." The conservative San Diego Union has noted that "the smallest agency on the Hill is the best in terms of efficiency and thoroughness. It is certainly the least political bunch—this is real sci, not political sci—in the world's most political town."

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# Technology Assessment and the Work of Congress

And in an editorial this spring, the conservative Washington Times wrote, "...the agency has emerged as the voice of authority in a city inundated with statistics and technical gobbledygook." It went on to note that one of the OTA's more important recent contributions was to point out, during the health-care debate, "that no one really knew how the various proposals would affect long-term costs." Over the past decade, delegations have come from all over the world to study OTA as a model of what they would like to achieve in their own country.

So, with all this success, what killed OTA?

It was small, and it got lost in the dust of the political stampede on the Hill to downsize and streamline.

It first got cut in the House budget bill. Rep. Amo Houghton, R-N.Y., former CEO of Corning Glass, and one of the most thoughtful people on the Hill, managed to resurrect it by trimming its already modest budget ($20 million out of a $2 billion budget for the legislative branch) and moving it under the Library of Congress, so that members could claim they had killed one of their own agencies.

Because this might have meant a cut of a few percentage points in the budget available to the library, Librarian of Congress James Billington lobbied hard on the Senate side to prevent the move. The vote in the Senate Appropriations committee was 13 to 11 to kill

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the agency. Sen. Specter was one of the 13. Several supporting Democrats who were absent neglected to file proxies.

Things went no better on the floor of the Senate, where multiple issues got intertwined, and enforcing party loyalty became the dominant concern. After the vote, in brief remarks from the floor, Sen. Ted Stevens, R-Alaska, a longtime supporter of OTA, sadly expressed his frustration and disappointment that this important little agency had gotten run over in the broader stampede to get an appropriations bill passed.

There was one last chance to save the agency at the end of the week, when the Conference Committee met to resolve differences between the House and Senate bills. Rep. Charles Taylor, R-N.C., who had promised to vote to restore the agency, left the meeting just before the vote was taken. The result was a tie, which under the rules meant OTA died.

Through a comedy of errors, oversight and political machismo, Congress had "chosen" ignorance, and ended the 23-year history of its best and smallest agency.

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*M. Granger Morgan is professor and head of the Department of Engineering and Public Policy at Carnegie Mellon University.*



# Congress's Science Agency Prepares to Close Its Doors

*by Warren E. Leary*
*New York Times*
*September 24, 1995*
*p. 26*

WASHINGTON, Sept. 21—After more than 20 years of advising lawmakers on the most complex scientific and technical issues, a small Congressional agency will soon cease to exist, but it is vigorously pursuing its mission to the last.

The agency, the Office of Technology Assessment, widely praised for offering impartial advice and analysis to the senators and representatives who must make decisions on technical issues in which they have little expertise, will close on Sept. 30.

Although little known to the public, the agency has had a presence and influence in many of the great scientific debates on Capitol Hill. As Congressmen passed laws and budgets dealing with issues like medical research, climate change, the space program, genetic engineering, telecommunications policy and defense against nuclear weapons, studies by the agency have played pivotal roles.

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# Technology Assessment and the Work of Congress

The agency, one of Congress's smallest with a $22 million annual budget and fewer than 200 employees, fell victim to budget cutting by the Republican majority and, its supporters say, shortsightedness about its value in providing unbiased, understandable advice on complex issues.

Some of the 130 professionals on the agency's staff have already left for other jobs, but most have stayed on and are working to the end to finish studies. Even as they empty desks, pack boxes and circulate resumes, staff members working in offices a few blocks from the Capitol are rushing to complete and distribute as many studies as possible before the deadline.

"We are going to put out 60 to 65 reports this year, compared to the 50 or so we normally release," said Dr. Roger C. Herdman, a doctor who has served as director of the agency since 1993. "It's really a point of pride for many of the people here to finish what they've started and get the reports to the people who asked for them."

Some studies, which normally take 18 months to 2 years to complete and can be hundreds of pages long, will be truncated because of the deadline, he said. Because there is no time to have some printed, he said, they will be distributed in photocopied versions or made available electronically on the Internet.

Several big studies were not far enough along to be finished, Dr. Herdman said, includ-

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ing reports on the role of the United States in United Nations peacekeeping operations and how to protect against weapons of mass destruction that fall into the hands of third parties like terrorists or small nations that do not have the means to build such arms.

Critics of the agency, including Representative Robert S. Walker, the Pennsylvania Republican who heads the House Science Committee, said that in the past, the agency had taken so long to do its comprehensive studies that they were released after legislation they could influence had been written. Dr. Herdman of the agency admitted that reports sometimes lagged behind legislation, but said agency researchers, when asked, issued shorter interim reports or testified at legislative hearings on the results of the studies in progress.

There are a number of theories about why the agency, which had been highly praised in Government, academic and scientific circles for its analyses and impartiality, lost out in the new effort of Congress to cut the size of its own budget. While some critics said the agency could be cut because its research duplicated work done by other public and private organizations, others said it had become vulnerable because of the way it was set up in 1972 to maintain its political neutrality.

The agency was established during the Nixon Administration to give Congress technical expertise equal to that available to the executive branch through its many departments

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and agencies.

Sometimes referred to as the think tank for Congress, the agency is overseen by a board with equal numbers of Republicans and Democrats and an even division between senators and representatives. To keep the agency from being overwhelmed with requests for studies and to insure quality, only the board or committee chairmen and ranking members of the minority party could request work. And the agency was prohibited from recommending a single policy after a study, being required instead to lay out different policy options and projecting what the consequences of each might be.

During floor debates, the agency's reports were often quoted by both sides of an issue, supporters say, indicating that the agency was doing its job of supplying factual material to elevate the discussion.

Because the agency tried to be so neutral and because it was insulated from direct contact with most members, proponents say, new committee chairmen and members of Congress brought into power with last year's Republican takeover had little or no knowledge or appreciation of the agency. Without visibility and champions, an agency can quickly find itself in trouble.

"If you belong to everyone, you belong to no one," said Dr. John H. Gibbons, head of the White House Office of Science and Technology Policy. Dr. Gibbons, who headed the

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technology office for 14 years before becoming President Clinton's science adviser in 1993, said the demise of the agency after it had proved its effectiveness reflected an anti-intellectual and anti-science mentality among some members of Congress who were not interested in looking at issues factually.

"Closing our eyes to issues is a very poor way to plan for our future," Dr. Gibbons said.

Senator Connie Mack, a Florida Republican who helped to lead the effort to kill the agency, and other opponents said its role could be filled by other Congressional fact-finding agencies, like the General Accounting Office, and Congressional Research Service, or private organizations, like the National Academy of Sciences.

But Representative Amo Houghton, a Republican whose New York district includes Elmira, Jamestown and suburban Ithaca, said the information explosion was the problem, not the solution. Mr. Houghton, who would have been chairman of the agency's board if it had survived, led the effort to save it. Obtaining unbiased information for making decisions has become harder, not easier, he said.

"O.T.A. acts as an impartial 'honest broker'" Mr. Houghton said. "Members of Congress are deluged with advice from many quarters, but it is often tinged with the underlying bias and political agenda of the bearer."

Mr. Houghton, who said he favored reducing Government and cutting costs, said some

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lawmakers wre so anxious to cut down the size of Government that they were not being selective. This shortsightedness, he said, will hurt the nation's ability to mobilize its resources in science and technology and to develop policies that create jobs and economic growth.

"We are cutting off one of the most important arms of Congress when we cut off unbiased knowledge about science and technology," Mr. Houghton said.

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Office of Technology Assessment

# OTA Publications

The links below lead to lists of OTA publications, arranged alphabetically, chronologically, and topically. OTA Reports from 1992-1995 are contained on this CD-ROM disk; the reports from earlier years are on other disks in the set.

**A → Z**
Reports by title

**1995 → 1972**
Reports by year

**Addiction → Workplace**
Reports by topic

The body text of the publications is fully searchable (with the exception of notes, captions, and indices). Use the Search command to locate reports containing specific text strings.



# OTA Publications

The 1992 World Administrative Radio Conference: Issues for U.S. International Spectrum Policy (November 1991—Disk 2)

The 1992 World Administrative Radio Conference: Technology and Policy Implications (May 1993)

## A

Access to Over-the-Road Buses for Persons With Disabilities (May 1993)

Access to Space: The Future of U.S. Space Transportation Systems (April 1990—Disk 2)

Accessibility and Integrity of Networked Information Collections (August 1993)

Acid Rain and Transported Air Pollutants: Implications for Public Policy (May 1984—Disk 4)

Adjusting to a New Security Environment: The Defense Technology and Industrial Base Challenge (February 1991—Disk 2)

Adolescent Health Insurance Status: Analyses of Trends in Coverage and Preliminary Estimates of the Effects of an Employer Mandate and Medicaid Expansion on the Uninsured (June 1989—Disk 2)

Adolescent Health, Vol. I: Summary and Policy Options (April 1991—Disk 2)

*Cont'd…*

*Jump to letter:*
A B C D E F
G H I-K L M
N O P Q-R S
T U V-Z

# OTA Publications

Adolescent Health, Vol. II: Background and the Effectiveness of Selected Prevention and Treatment Services (October 1991—Disk 2)
Adolescent Health, Vol. III: Crosscutting Issues in the Delivery of Health and Related Services (June 1991—Disk 2)
Adult Literacy and New Technologies: Tools for a Lifetime (July 1993)
Advanced Automotive Technology: Visions of a Super-Efficient Family Car (September 1995)
Advanced High-Speed Aircraft (April 1980—Disk 5)
Advanced Materials by Design (June 1988—Disk 3)
Advanced Network Technology (June 1993)
Advanced Vehicle/Highway Systems and Urban Traffic Problems (September 1989—Disk 2)
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## Addiction

*See Substance abuse and addiction*

## Aging

*See also Alzheimer's disease and other dementias; Cancer; Disabilities; Health and health technology; Osteoporosis*

Costs and Effectiveness of Cholesterol Screening in the Elderly (April 1989—Disk 2)
The Use of Preventive Services by the Elderly (January 1989—Disk 2)
Institutional Protocols for Decisions About Life-Sustaining Treatments (July 1988—Disk 3)
Screening for Open-Angle Glaucoma in the Elderly (October 1988—Disk 3)
Life-Sustaining Technologies and the Elderly (July 1987—Disk 3)
Technology and Aging in America (June 1985—Disk 4)

## Agricultural technology

*See also Biological research and technology; Competitiveness;*

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*Environmental protection; Foods and nutrition; Insect and pest management technology; International relations and technology transfer; Research and development*

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Challenges for U.S. Agricultural Research Policy (September 1995)

Targeting Environmental Priorities in Agriculture: Reforming Program Strategies (September 1995)

Technology and Policy for Suppressing Grain Dust Explosions in Storage Facilities (September 1995)

Potential Environmental Impacts of Bioenergy Crop Production (September 1993)

A New Technological Era for American Agriculture (August 1992)

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Technologies To Benefit Agriculture and Wildlife (May 1985—Disk 4)
Technology, Public Policy, and the Changing Structure of American Agriculture: A Special Report for the 1985 Farm Bill (March 1985—Disk 4)
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An Assessment of the United States Food and Agricultural Research System (December 1981—Disk 5)
Drugs in Livestock Feed (June 1979—Disk 5)
Organizing and Financing Basic Research To Increase Food Production (June 1977—Disk 5)

## AIDS/HIV infection

*See also Health and health technology; Research and development*

Adverse Reactions to HIV Vaccines: Medical, Ethical, and Legal Issues (September 1995)
The Effectiveness of AIDS Prevention Efforts (September 1995)
External Review of the Federal Centers for Disease Control and Prevention's HIV Prevention Program: Summary and Overview (September 1994)

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The CDC's Case Definition of AIDS: Implications of Proposed Revisions (June 1992)

Difficult-To-Reuse Needles for the Prevention of HIV Infection Among Injecting Drug Abusers (October 1992)

HIV in the Health Care Workplace (November 1991—Disk 2)

The Effectiveness of Drug Abuse Treatment: Implications for Controlling AIDS/HIV Infection (September 1990—Disk 2)

How Has Federal Research on AIDS/HIV Disease Contributed to Other Fields? (April 1990—Disk 2)

AIDS and Health Insurance: An OTA Survey (February 1988—Disk 3)

How Effective Is AIDS Education? (June 1988—Disk 3)

The Impact of AIDS on the Kaiser Permanente Medical Care Program (Northern California Region) (July 1988—Disk 3)

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Do Insects Transmit AIDS? (September 1987—Disk 3)

Review of the Public Health Service's Response to AIDS (February 1985—Disk 4)

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## Air pollution

*See Environmental protection*

## Alcoholism and alcohol abuse

*See Health and health technology; Substance abuse and addiction*

## Alternative fuels

*See also Climate change; Energy efficiency; Energy technology; Environmental protection; Oceans and oceanography; Oil, gas, and mineral resources; Transportation*

Replacing Gasoline: Alternative Fuels for Light-Duty Vehicles (September 1990—Disk 2)

Environmental Issues of Synthetic Transportation Fuels From Coal (December 1982—Disk 4)

Increased Automobile Fuel Efficiency and Synthetic Fuels: Alternatives for Reducing Oil Imports (September 1982—Disk 4)

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Water Availability for Synthetic Fuels: An Assessment of Current Studies (October 1982—Disk 4)
Gasohol (September 1979—Disk 5)

## Alzheimer's disease and other dementias

*See also Aging; Biological research and technology; Mental health*

Special Care Units for People With Alzheimer's and Other Dementias: Consumer Education, Research, Regulatory, and Reimbursement Issues (August 1992)
Confused Minds, Burdened Families: Finding Help for People With Alzheimer's and Other Dementias (July 1990—Disk 2)
Losing a Million Minds: Confronting the Tragedy of Alzheimer's Disease and Other Dementias (April 1987—Disk 3)

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## Arms control

*See Defense technology*

## Automobiles and automobile industry

*See Alternative fuels; Competitiveness; Energy efficiency; Transportation*

## Aviation

*See Transportation*

## Banks and banking

*See Computer security; Information technology; Telecommunications*

## Biological diversity

*See also Forests and forestry*

Technologies To Maintain Biological Diversity (March 1987—Disk 3)

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Assessing Biological Diversity in the United States: Data Considerations (March 1986—Disk 3)
Grassroots Conservation of Biological Diversity in the United States (February 1986—Disk 3)

## Biological research and technology

*See also Agricultural technology; Alzheimer's disease and other dementias; Health and health technology; Law and law enforcement technology; Mental health; Research and development; Science and technology*

Federal Technology Transfer and the Human Genome Project (September 1995)
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## Biological weapons

*See Defense technology*

## Biomaterials

*See also Materials*

Biopolymers: Making Materials Nature's Way (September 1993)

## Biotechnology

*See Biological research and technology*

## Business and industry

*See also Competitiveness; Computer technology; Defense technology; Economic development; Economy; Employment and training; International relations and technology transfer; Metals industry*

Innovation and Commercialization of Emerging Technologies (September 1995)
Screening and Testing Chemicals in Commerce (September 1995)

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## Cancer

*See also Aging; Health and health technology; Women's health*

The Cost-Effectiveness of Colorectal Cancer Screening in Average-Risk Adults (April 1995)

Costs and Effectiveness of Prostate Cancer Screening in Elderly Men (May 1995)

The Costs and Effectiveness of Cervical Cancer Screening in Elderly Women (February 1990—Disk 2)

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Unconventional Cancer Treatments (September 1990—Disk 2)

Identifying and Regulating Carcinogens (November 1987—Disk 3)

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## Chemical weapons

*See Defense technology; Hazardous waste*

## Children's health

*See also Health and health technology; Mental health*

Adolescent Health, Vol. I: Summary and Policy Options (April 1991—Disk 2)

Adolescent Health, Vol. II: Background and the Effectiveness of Selected Prevention and Treatment Services (October 1991—Disk 2)

Adolescent Health, Vol. III: Crosscutting Issues in the Delivery of Health and Related Services (June 1991—Disk 2)

Children's Dental Services Under the Medicaid Program (October 1990—Disk 2)

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Healthy Children: Investing in the Future (February 1988—Disk 3)

Neonatal Intensive Care for Low Birthweight Infants: Costs and Effectiveness (December 1987—Disk 3)

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Technology Dependent Children: Hospital Vs. Home Care (May 1987—Disk 3)
The Costs and Effectiveness of Neonatal Intensive Care (August 1981—Disk 5)

## Climate change

*See also Alternative fuels; Environmental protection; Remote sensing; Space*

Climate Treaties and Models: Issues in the International Management of Climate Change (June 1994)
Preparing for an Uncertain Climate—Vol. I (October 1993)
Preparing for an Uncertain Climate—Vol. II (October 1993)
Changing by Degrees: Steps To Reduce Greenhouse Gases (February 1991—Disk 2)

## Communications

*See also Computer technology; Information technology; Research and development;Telecommunications*

The 1992 World Administrative Radio Conference: Technology and Policy Implications (May 1993)

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The Feasibility and Value of Broadband Communications in Rural Areas: A Preliminary Evaluation (April 1976—Disk 5)

## Competitiveness

*See also Agricultural technology; Business and industry; Defense technology; Economic development; Economy; Environmental protection; International relations and technology transfer; Metals industry; Science and technology; Space*

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Making Things Better: Competing in Manufacturing (February 1990—Disk 2)
International Competition in Services: Banking, Building, Software, Know-How... (July 1987—Disk 3)
A Review of U.S. Competitiveness in Agricultural Trade (October 1986—Disk 3)
Wood Use: U.S. Competitiveness and Technology—Vol. II (November 1984—Disk 4)
International Competitiveness in Electronics (November 1983—Disk 4)
Wood Use: U.S. Competitiveness and Technology—Vol. I (August 1983—Disk 4)
U.S. Industrial Competitiveness: A Comparison of Steel, Electronics, and Automobiles (July 1981—Disk 5)
Technology and Steel Industry Competitiveness (June 1980—Disk 5)

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## Computer security

*See also Information technology*

Issue Update on Information Security and Privacy in Network Environments (September 1995)
Information Security and Privacy in Network Environments (September 1994)
Protecting Privacy in Computerized Medical Information (September 1993)
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Electronic Record Systems and Individual Privacy (June 1986—Disk 3)
Electronic Surveillance and Civil Liberties (October 1985—Disk 4)
Selected Electronic Funds Transfer Issues: Privacy, Security, and Equity (March 1982—Disk 4)

## Computer technology

*See also Business and industry; Communications; Defense technology; Education; Employment and training; Information technology; Law and law enforcement technology; Science and technology; Telecommunications*

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Automation of America's Offices, 1985-2000 (December 1985—Disk 4)
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## Crime and criminal justice

*See Law and law enforcement technology*

## Defense technology

*See also Business and industry; Computer technology; Economy; Environmental protection; Hazardous waste; International relations and technology transfer*

Assessing the Potential for Civil-Military Integration: Selected Case Studies (September 1995)

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Technologies for NATO's Follow-On Forces Attack Concept (July 1986—Disk 3)
Anti-Satellite Weapons, Countermeasures, and Arms Control (September 1985—Disk 4)
Ballistic Missile Defense Technologies (September 1985—Disk 4)
Arms Control in Space (May 1984—Disk 4)
Directed Energy Missile Defense in Space (April 1984—Disk 4)
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The Effects of Nuclear War (May 1979—Disk 5)

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Nuclear Proliferation and Safeguards (June 1977—Disk 5)
Nuclear Proliferation and Safeguards: Appendix Volume II, Part One (June 1977—Disk 5)
Nuclear Proliferation and Safeguards: Appendix Volume II, Part Two (June 1977—Disk 5)

## Developing countries

*See Agricultural technology; Energy technology; Forests and forestry; International relations and technology transfer*

## Disabilities

*See also Aging; Education; Health and health technology; Mental Health; Transportation*

Psychiatric Disabilities, Employment and the Americans With Disabilities Act (March 1994)
Access to Over-the-Road Buses for Persons With Disabilities (May 1993)
Hearing Impairment and Elderly People (May 1986—Disk 3)

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Assistive Devices for Severe Speech Impairments (December 1983—Disk 4)
Selected Telecommunications Devices for Hearing-Impaired Persons (December 1982—Disk 4)
Technology and Handicapped People (May 1982—Disk 4)

## Drugs

*See AIDS/HIV infection; Health and health technology; Law and law enforcement technology; Pharmaceuticals; Substance abuse and addiction*

## Economic development

*See also Business and industry; Competitiveness; Employment and training; Research and development; Science and technology*

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Technology, Innovation, and Regional Economic Development (July 1984—Disk 4)
Census of State Government Initiatives for High-Technology Industrial Development (May 1983—Disk 4)
Encouraging High-Technology Development (April 1983—Disk 4)

## Economy

*See also Business and industry; Competitiveness; Defense technology; Employment and training*

Energy Use and the U.S. Economy (June 1990—Disk 2)
Statistical Needs for a Changing U.S. Economy (September 1989—Disk 2)

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## Education

*See also Computer technology; Disabilities; Employment and training; Information technology; Science and technology*

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Risks to Students in School (September 1995)
Teachers and Technology: Making the Connection (April 1995)
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Higher Education for Science and Engineering (March 1989—Disk 2)
Linking for Learning: A New Course for Education (November 1989—Disk 2)
Performance Standards for Secondary School Vocational Education (April 1989—Disk 2)
Educating Scientists and Engineers: Grade School to Grad School (June 1988—Disk 3)
Elementary and Secondary Education for Science and Engineering (December 1988—Disk 3)

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Preparing for Science and Engineering Careers: Field Level Profiles (January 1987—Disk 3)
State Educational Testing Practices (December 1987—Disk 3)
Trends and Status of Computers in Schools: Use in Chapter 1 Programs and Use With Limited English Proficient Students (March 1987—Disk 3)
Scientific Equipment for Undergraduates: Is It Adequate? (September 1986—Disk 3)
Technology and Learning Disabilities (December 1983—Disk 4)
Informational Technology and Its Impact on American Education (November 1982—Disk 4)

## Electric power

*See also Energy efficiency; Energy technology*

Studies of the Environmental Costs of Electricity (September 1994)
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Electric Power Wheeling and Dealing: Technological Considerations for Increasing Competition (May 1989—Disk 2)
New Electric Power Technologies: Problems and Prospects for the 1990s (July 1985—Disk 4)

## Employment and training

*See also Business and industry; Computer technology; Economic development; Economy; Education*

Does Vocational Education Help the "Forgotten Half"?: Short-term Economic Consequences of High School Vocational Education for Non-College Students (September 1995)
Occupational Training for Young People in the United Kingdom (September 1995)
Performance Standards for the Food Stamp Employment and Training Program (February 1992)
The Use of Integrity Tests for Pre-Employment Screening (September 1990—Disk 2)

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Demographic Trends and the Scientific and Engineering Workforce (December 1985—Disk 4)
Displaced Homemakers: Programs and Policy (October 1985—Disk 4)
Automation and the Workplace: Selected Labor, Education, and Training Issues (March 1983—Disk 4)

## Energy efficiency

*See also Alternative fuels; Electric power; International relations and technology transfer; Oil, gas, and mineral resources; Transportation*

Energy Efficiency in Federal Facilities: Update on Funding and Potential Savings (May 1994)
Saving Energy in U.S. Transportation (July 1994)

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Energy Efficiency Technologies for Central and Eastern Europe (May 1993)
Industrial Energy Efficiency (August 1993)
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Energy Efficiency in the Federal Government: Government by Good Example? (May 1991—Disk 2)
Improving Automobile Fuel Economy: New Standards, New Approaches (October 1991—Disk 2)
Energy Efficiency of Buildings in Cities (March 1982—Disk 4)
Residential Energy Conservation (July 1979—Disk 5)

## Energy technology

*See also Alternative fuels; Electric power; International relations and technology transfer; Nuclear energy; Oceans and oceanography; Oil, gas, and mineral resources*

Renewing Our Energy Future (September 1995)

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Industrial and Commercial Cogeneration (February 1983—Disk 4)
Industrial Energy Use (June 1983—Disk 4)
Energy From Biological Processes (July 1980—Disk 5)
Energy from Biological Processes: Volume II—Technical and Environmental Analyses (September 1980—Disk 5)
An Analysis of the ERDA Plan and Program (October 1978—Disk 5)
Analysis of the Proposed National Energy Plan (August 1977—Disk 5)
Comparative Analysis of the 1976 ERDA Plan and Program (May 1976—Disk 5)

## Environmental health

*See also Health and health technology*

Gauging Control Technology and Regulatory Impacts in Occupational Safety and Health: An Appraisal of OSHA's Analytic Approach (September 1995)

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The Department of Defense Kuwait Oil Health Fire Risk Assessment (The "Persian Gulf Veterans' Registry") (September 1994)
The Department of Veterans Affairs Persian Gulf Veterans' Health Registry (September 1993)
Passive Smoking in the Workplace: Selected Issues (May 1986—Disk 3)
Preventing Illness and Injury in the Workplace (April 1985—Disk 4)
Reproductive Health Hazards in the Workplace (December 1985—Disk 4)
Reproductive Health Hazards in the Workplace: Selected Aspects of Reproductive Health Hazards Regulations (October 1985—Disk 4)

## Environmental protection

*See also Agricultural technology; Alternative fuels; Climate change; Competitiveness; Forests and forestry; Hazardous waste; Oceans and oceanography; Waste management*

Environmental Policy Tools: A User's Guide (September 1995)
Environmental Technology: Analysis of Selected Federal R&D Programs (July 1995)
EPA Superfund Actions and ATSDR Public Health Data (July 1995)

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Dioxin Treatment Technologies (November 1991—Disk 2)
Beneath the Bottom Line: Agricultural Approaches To Reduce Agrichemical Contamination of Groundwater (November 1990—Disk 2)
Catching Our Breath: Next Steps for Reducing Urban Ozone (July 1989—Disk 2)
Technologies for Reducing Dioxin in the Manufacture of Bleached Wood Pulp (May 1989—Disk 2)
Urban Ozone and the Clean Air Act: Problems and Proposals for Change (April 1988—Disk 3)
Technologies for the Preservation of Prehistoric and Historic Landscapes (July 1987—Disk 3)
Technologies for Prehistoric and Historic Preservation (September 1986—Disk 3)
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Environmental Protection in the Federal Coal Leasing Program (May 1984—Disk 4)
Protecting the Nation's Groundwater from Contamination—Vol. I (October 1984—Disk 4)
Protecting the Nation's Groundwater from Contamination—Vol. II (October 1984—Disk 4)
Wetlands: Their Use and Regulation (March 1984—Disk 4)
Use of Models for Water Resources Management, Planning, and Policy (August 1982—Disk 4)
A Review of the U.S. Environmental Protection Agency: Environmental Research Outlook FY 1976 Through 1980 (August 1976—Disk 5)

## Fishing industry

*See also Oceans and oceanography*

Current Status of Federal Involvement in U.S. Aquaculture (September 1995)
Fish Passage Technologies: Protection at Hydropower Facilities (September 1995)
Selected Technology Issues in U.S. Aquaculture (September 1995)
Competition in Coastal Seas: An Evaluation of Foreign Maritime Activities in the 200-Mile EEZ (July 1989—Disk 2)

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Establishing a 200-Mile Fisheries Zone (June 1977—Disk 5)

## Foods and nutrition

*See also Agricultural technology*

Enhancing the Quality of U.S. Grain for International Trade (February 1989—Disk 2)
Grain Quality in International Trade: A Comparison of Major U.S. Competitors (February 1989—Disk 2)
Pesticide Residues in Food: Technologies for Detection (October 1988—Disk 3)
Environmental Contaminants in Food (December 1979—Disk 5)
Open Shelf-Life Dating of Food (August 1979—Disk 5)
Emerging Food Marketing Technologies: A Preliminary Analysis (October 1978—Disk 5)
Nutrition Research Alternatives (September 1978—Disk 5)
Perspectives on Federal Retail Food Grading (June 1977—Disk 5)
Food Information Systems (February 1976—Disk 5)
Food Information Systems: Summary and Analysis (August 1976—Disk 5)

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## Forests and forestry

*See also Biological diversity; Environmental protection*

Combined Summaries: Technologies To Sustain Tropical Forest Resources and Biological Diversity (May 1992)

Forest Service Planning: Accommodating Uses, Producing Outputs, and Sustaining Ecosystems (February 1992)

Forest Service Planning: Setting Strategic Direction Under RPA (July 1990—Disk 2)

Technologies To Sustain Tropical Forest Resources and Biological Diversity (March 1984—Disk 4)

Sustaining Tropical Forest Resources: Reforestation of Degraded Lands (May 1983—Disk 4)

Sustaining Tropical Forest Resources: U.S. and International Institutions (May 1983—Disk 4)

## Fuel

*See Alternative fuels; Energy efficiency; Energy technology; Oil, gas, and*

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*mineral resources*

## Genetic research

*See Biological research and technology*

## Hazardous waste

*See also Environmental protection; Nuclear energy; Superfund; Transportation; Waste management*

Cleaning Up Contaminated Wood-Treating Sites (September 1995)

Nuclear Wastes in the Arctic: An Analysis of Arctic and Other Regional Impacts From Soviet Nuclear Contamination (September 1995)

Dismantling the Bomb and Managing the Nuclear Materials (September 1993)

Hazards Ahead: Managing Cleanup Worker Health and Safety at the Nuclear Weapons Complex (February 1993)

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Partnerships Under Pressure: Managing Commercial Low-Level Radioactive Waste (November 1989—Disk 2)
An Evaluation of Options for Managing Greater-Than-Class-C Low-Level Radioactive Waste (October 1988—Disk 3)
Issues in Medical Waste Management (October 1988—Disk 3)
From Pollution to Prevention: A Progress Report on Waste Reduction (June 1987—Disk 3)
Ocean Incineration: Its Role in Managing Hazardous Waste (August 1986—Disk 3)
Serious Reduction of Hazardous Waste: for Pollution Prevention and Industrial Efficiency (September 1986—Disk 3)
Managing the Nation's Commercial High-Level Radioactive Waste (March 1985—Disk 4)
Habitability of the Love Canal Area: An Analysis of the Technical Basis for the Decision on the Habitability of the Emergency Declaration Area (June 1983—Disk 4)

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Technologies and Management Strategies for Hazardous Waste Control (March 1983—Disk 4)
Nonnuclear Industrial Hazardous Waste: Classifying for Hazard Management (November 1981—Disk 5)

## Health and health technology

*See also Aging; AIDS/HIV infection; Biological research and technology; Cancer; Children's health; Disabilities; Environmental health; Information technology; Medical malpractice; Mental health; Pharmaceuticals; Women's health*

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Health Care Technology and Its Assessment in Eight Countries (February 1995)
Hospital Financing in Seven Countries (June 1995)
Impact of Health Reform on Rural Areas: Lessons From the States (September 1995)
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International Health Statistics: What the Numbers Mean for the United States (September 1994)
Managed Care and Competitive Health Care Markets: The Twin Cities Experience (July 1994)
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Tools for Evaluating Health Technologies: Five Background Papers (September 1994)
Understanding Estimates of National Health Expenditures Under Health Reform (May 1994)
Understanding Estimates of the Impact of Health Reform on the Federal Budget (July 1994)
Universal Health Insurance and Uninsured People: Effects on Use and Cost (September 1994)
Benefit Design in Health Care Reform: Clinical Preventive Services (September 1993)
Benefit Design in Health Care Reform: Patient Cost-Sharing (September 1993)
Compilation of Abbreviations and Terms (September 1993)

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Health Insurance: The Hawaii Experience (June 1993)
An Inconsistent Picture: A Compilation of Analyses of Economic Impacts of Competing Approaches to Health Care Reform by Experts and Stakeholders (June 1993)
Does Health Insurance Make a Difference? (September 1992)
Evaluation of the Oregon Medicaid Proposal (May 1992)
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Outpatient Immunosuppressive Drugs Under Medicare (July 1991—Disk 2)
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Indian Health Care (April 1986—Disk 3)
Nurse Practitioners, Physician Assistants, and Certified Nurse-Midwives: A Policy Analysis (December 1986—Disk 3)
Payment for Physician Services: Strategies for Medicare (February 1986—Disk 3)
Blood Policy and Technology (January 1985—Disk 4)
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Medical Devices and the Veterans Administration (February 1985—Disk 4)

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The Contact Lens Industry: Structure, Competition, and Public Policy (December 1984—Disk 4)
Federal Policies and the Medical Devices Industry (November 1984—Disk 4)
The Hemodialysis Equipment and Disposables Industry (December 1984—Disk 4)
Intensive Care Units (ICUs): Clinical Outcomes, Costs, and Decisionmaking (November 1984—Disk 4)
The Market for Wheelchairs: Innovations and Federal Policy (November 1984—Disk 4)
Medical Technology and the Costs of the Medicare Program (July 1984—Disk 4)
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Medical Technology Under Proposals To Increase Competition in Health Care (October 1982—Disk 4)
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The Implications of Cost-Effectiveness Analysis of Medical Technology (August 1980—Disk 5)
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The Management of Health Care Technology in Ten Countries (October 1980—Disk 5)
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A Review of Selected Federal Vaccine and Immunization Policies, Based on Case Studies of Pneumococcal Vaccine (September 1979—Disk 5)

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Policy Implications of Medical Information Systems (December 1977—Disk 5)
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## Information technology

*See also Communications; Computer security; Computer technology; Education; Health and health technology; Law and law enforcement technology; Research and development; Science and technology; Telecommunications*

Bringing Health Care Online: The Role of Information Technologies (September 1995)
Information Technologies for the Control of Money Laundering (September 1995)

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Wage Record Information Systems (May 1994)
Making Government Work: Electronic Delivery of Federal Services (September 1993)
Electronic Bulls and Bears: U.S. Securities Markets and Information Technology (September 1990—Disk 2)
Trading Around the Clock: Global Securities Markets and Information Technology (July 1990—Disk 2)
Federal Scientific and Technical Information in an Electronic Age: Opportunities and Challenges (October 1989—Disk 2)
Electronic Delivery of Public Assistance Benefits: Technology Options and Policy Issues (April 1988—Disk 3)
Informing the Nation: Federal Information Dissemination in an Electronic Age (October 1988—Disk 3)
The Electronic Supervisor: New Technology, New Tensions (September 1987—Disk 3)
Hospital Information Systems at the Veterans Administration (September 1987—Disk 3)

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Federal Government Information Technology: Management, Security, and Congressional Oversight (February 1986—Disk 3)
The Social Security Administration and Information Technology (October 1986—Disk 3)
Information Technology R&D: Critical Trends and Issues (February 1985—Disk 4)
Effects of Information Technology on Financial Services Systems (September 1984—Disk 4)
Review of Postal Automation Strategy: A Technical and Decision Analysis (June 1984—Disk 4)
Implications of Electronic Mail and Message Systems for the U.S. Postal Service (August 1982—Disk 4)
Computer-Based National Information Systems: Technology and Public Policy Issues (September 1981—Disk 5)
A Preliminary Analysis of the IRS Tax Administration System (March 1977—Disk 5)

## Insect and pest management technology

*See also Agricultural technology*

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Biologically Based Technologies for Pest Control (September 1995)
Harmful Non-Indigenous Species in the United States (September 1993)
Plague of Locusts—Special Report (June 1990—Disk 2)
Pest Management Strategies in Crop Protection (October 1979—Disk 5)

## International relations and technology transfer

*See also Agricultural technology; Business and industry; Competitiveness; Energy efficiency; Energy technology; Space*

Export Controls and Nonproliferation Policy (May 1994)
New Opportunities for U.S. Universities in Development Assistance: Agriculture, Natural Resources, and Environment (September 1991—Disk 2)
Technology Transfer to the United States: The MIT-Japan Science and Technology Program (April 1989—Disk 2)
Grassroots Development: The African Development Foundation (June 1988—Disk 3)
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Energy Technology Transfer to China (September 1985—Disk 4)

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Technology Transfer to the Middle East (September 1984—Disk 4)
Technology and East-West Trade: An Update (May 1983—Disk 4)
Technology and Soviet Energy Availability (November 1981—Disk 5)
Technology and East-West Trade (November 1979—Disk 5)

## Labor

*See Business and industry; Employment and training*

## Law and law enforcement technology

*See also Biological research and technology; Computer technology; Information technology; Medical malpractice; Science and technology*

Electronic Surveillance in a Digital Age (July 1995)
Alternative Coca Reduction Strategies in the Andean Region (July 1993)
Police Body Armor Standards and Testing, Vol. I (August 1992)
Police Body Armor Standards and Testing, Vol. II—Appendixes (August 1992)

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Intellectual Property Rights in an Age of Electronics and Information (April 1986—Disk 3)
Scientific Validity of Polygraph Testing: A Research Review and Evaluation (November 1983—Disk 4)
An Assessment of Alternatives for a National Computerized Criminal History System (October 1982—Disk 4)
A Preliminary Assessment of the National Crime Information Center and the Computerized Criminal History System (December 1978—Disk 5)

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## Manufacturing

*See Business and industry; Competitiveness*

## Materials

*See also Biomaterials; Superconductors*

Advanced Materials by Design (June 1988—Disk 3)

New Structural Materials Technologies: Opportunities for the Use of Advanced Ceramics and Composites (September 1986—Disk 3)

Strategic Materials: Technologies To Reduce U.S. Import Vulnerability (May 1985—Disk 4)

Engineering Implications of Chronic Materials Scarcity (April 1977—Disk 5)

An Assessment of Alternative Economic Stockpiling Policies (August 1976—Disk 5)

An Assessment of Information Systems Capabilities Required To Support U.S. Materials Policy Decisions (December 1976—Disk 5)

Requirements for Fulfilling a National Materials Policy (August 1974—Disk 5)

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## Medicaid and Medicare

*See Health and health technology; Medical malpractice (below)*

## Medical malpractice

*See also Health and health technology; Law and law enforcement technology*

Defensive Medicine and Medical Malpractice (July 1994)
Impact of Legal Reforms on Medical Malpractice Costs (September 1993)
Do Medicaid and Medicare Patients Sue More Often Than Other Patients? (September 1992)

## Mental health

*See also Alzheimer's disease and other dementias; Biological research and technology; Children's health; Disabilities; Health and health technology*

Mental Disorders and Genetics: Bridging the Gap Between Research and Society (September 1994)
The Biology of Mental Disorders (September 1992)

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Indian Adolescent Mental Health (January 1990—Disk 2)
Children's Mental Health: Problems and Services (December 1986—Disk 3)
The Efficacy and Cost Effectiveness of Psychotherapy (October 1980—Disk 5)

## Metals industry

*See also Business and industry; Competitiveness*

Nonferrous Metals: Industry Structure (September 1990—Disk 2)
Copper: Technology and Competitiveness (September 1988—Disk 3)
Technical Options for Conservation of Metals: Case Studies of Selected Metals and Products (September 1979—Disk 5)

## Natural disasters

Reducing Earthquake Losses (September 1995)
Criteria for Evaluating the Implementation Plan Required By the Earthquake Hazards Reduction Act of 1977 (January 1980—Disk 5)
Issues and Options in Flood Hazards Management (February 1980—Disk 5)
U.S. Disaster Assistance to Developing Countries: Lessons Applicable to U.S. Domestic Disaster Programs (January 1980—Disk 5)

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## Nuclear energy

*See also Energy technology; Hazardous waste*

The Fusion Energy Program: The Role of TPX and Alternate Concepts (February 1995)

Technical Options for the Advanced Liquid Metal Reactor (May 1994)

Aging Nuclear Power Plants: Managing Plant Life and Decommissioning (September 1993)

Starpower: The U.S. and the International Quest for Fusion Energy (October 1987—Disk 3)

Nuclear Power in an Age of Uncertainty (February 1984—Disk 4)

Nuclear Powerplant Standardization: Light Water Reactors (April 1981—Disk 5)

## Nuclear war and nuclear weapons

*See Defense technology; Hazardous waste*

## Oceans and oceanography

*See also Alternative fuels; Energy technology; Environmental protection;*

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# OTA Publications

*Fishing industry; Oil, gas, and mineral resources; Oil spills; Transportation*

- Marine Minerals: Exploring Our New Ocean Frontier (July 1987—Disk 3)
- Technologies for Underwater Archaeology and Maritime Preservation (September 1987—Disk 3)
- Wastes in Marine Environments (April 1987—Disk 3)
- Marine Applications for Fuel Cell Technology (February 1986—Disk 3)
- Technology and Oceanography: An Assessment of Federal Technologies for Oceanographic Research and Monitoring (June 1981—Disk 5)
- Ocean Margin Drilling (May 1980—Disk 5)
- Recent Developments in Ocean Thermal Energy (April 1980—Disk 5)
- Renewable Ocean Energy Sources: Part I—Ocean Thermal Energy Conversion (May 1978—Disk 5)
- Coastal Effects of Offshore Energy Systems: An Assessment of Oil and Gas Systems, Deepwater Ports, and Nuclear Powerplants Off the Coasts of New Jersey and Delaware (November 1976—Disk 5)
- Analysis of the Feasibility of Separating Exploration From Production of Oil and Gas on the Outer Continental Shelf (May 1975—Disk 5)

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## Oil, gas, and mineral resources

*See also Alternative fuels; Energy efficiency; Energy technology; Oceans and oceanography*

U.S. Oil Import Vulnerability: The Technical Replacement Capability (October 1991—Disk 2)
Royalty Management Program's Auditing and Financial System: Technical Issues (July 1990—Disk 2)
Oil Production in the Arctic National Wildlife Refuge: The Technology and the Alaskan Oil Context (February 1989—Disk 2)
Polar Prospects: A Minerals Treaty for Antarctica (September 1989—Disk 2)
U.S. Oil Production: The Effect of Low Oil Prices (July 1987—Disk 3)
Potential Effects of Section 3 of the Federal Coal Leasing Amendments Act of 1976 (March 1986—Disk 3)
Western Surface Mine Permitting and Reclamation (June 1986—Disk 3)
Oil and Gas Technologies for the Arctic and Deepwater (May 1985—Disk 4)
U.S. Natural Gas Availability: Gas Supply Through the Year 2000 (February 1985—Disk 4)
U.S. Vulnerability to an Oil Import Curtailment (September 1984—Disk 4)

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An Assessment of Development and Production Potential of Federal Coal Leases (December 1981—Disk 5)
Coal Exports and Port Development (April 1981—Disk 5)
Patterns and Trends in Federal Coal Lease Ownership, 1950-80 (April 1981—Disk 5)
Alternative Energy Futures: Part I—The Future of Liquefied Natural Gas Imports (March 1980—Disk 5)
An Assessment of Oil Shale Technologies (June 1980—Disk 5)
Assessment of Oil Shale Technologies—Vol. II: A History and Analysis of the Federal Prototype Oil Shale Leasing Program (July 1980—Disk 5)
World Petroleum Availability 1980-2000 (November 1980—Disk 5)
Analysis of Laws Governing Access Across Federal Lands: Options for Access in Alaska (February 1979—Disk 5)
The Direct Use of Coal (April 1979—Disk 5)
Management of Fuel and Nonfuel Minerals in Federal Land (April 1979—Disk 5)
Enhanced Oil Recovery Potential in the United States (January 1978—Disk 5)

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A Technology Assessment of Coal Slurry Pipelines (March 1978—Disk 5)
Status Report on the Gas Potential From Devonian Shales of the Appalachian Basin (November 1977—Disk 5)
Analysis of the Impacts of the Projected Natural Gas Curtailments for the Winter 1975-76 (November 1975—Disk 5)

## Oil spills

*See also Oceans and oceanography*

Bioremediation for Marine Oil Spills (May 1991—Disk 2)
Coping With an Oiled Sea (March 1990—Disk 2)
Oil Transportation by Tankers: An Analysis of Marine Pollution and Safety Measures (July 1975—Disk 5)

## Osteoporosis

*See also Aging; Women's health*

Effectiveness and Costs of Osteoporosis Screening and Hormone Replacement Therapy, Vol. I: Cost-Effectiveness Analysis (August 1995)

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Effectiveness and Costs of Osteoporosis Screening and Hormone Replacement Therapy, Vol. II: Evidence on Benefits, Risks, and Costs (September 1995)
Public Information About Osteoporosis: What's Available, What's Needed? (September 1994)
Hip Fracture Outcomes in People Age 50 and Over (September 1994)

## OTA Annual Reports

Annual Report to the Congress: Fiscal Year 1995 (March 1996)
Annual Report to the Congress: Fiscal Year 1994 (March 1995)
Annual Report to the Congress: Fiscal Year 1993 (March 1994)
Annual Report to the Congress: Fiscal Year 1991 (March 1992)
Annual Report to the Congress: Fiscal Year 1985 (March 1986—Disk 3)
Annual Report to the Congress: Fiscal Year 1984 (March 1985—Disk 4)
Annual Report to the Congress: January 1 to September 30, 1983 (March 1984—Disk 4)
Annual Report to the Congress for 1982 (March 1983—Disk 4)
Annual Report to the Congress for 1981 (March 1982—Disk 4)
Annual Report to the Congress for 1980 (March 1981—Disk 5)
Annual Report to the Congress for 1979 (March 1980—Disk 5)

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Annual Report to the Congress for 1978 (March 1979—Disk 5)
OTA Priorities 1979, With Brief Descriptions of Priorities and of Assessments in Progress (March 1979—Disk 5)
Annual Report to the Congress for 1977 (March 1978—Disk 5)
Annual Report to the Congress by the Office of Technology Assessment: March 15, 1977 (March 1977—Disk 5)
Annual Report to the Congress by the Office of Technology Assessment: March 15, 1976 (March 1976—Disk 5)
Annual Report to the Congress by the Office of Technology Assessment: March 15, 1975 (March 1975—Disk 5)
Annual Report to the Congress by the Office of Technology Assessment: March 15, 1974 (March 1974—Disk 5)

## Patents

*See Biological research and technology; Business and industry; Pharmaceuticals*

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## Pharmaceuticals

*See also Health and health technology*

Impacts of Antibiotic-Resistant Bacteria (September 1995)
Drug Labeling in Developing Countries (February 1993)
Pharmaceutical R&D: Costs, Risks, and Rewards (February 1993)
Federal and Private Roles in the Development and Provision of Alglucerase Therapy for Gaucher Disease (October 1992)
The Information Content of Premanufacture Notices (April 1983—Disk 4)
Postmarketing Surveillance of Prescription Drugs (November 1982—Disk 4)
Patent-Term Extension and the Pharmaceutical Industry (August 1981—Disk 5)
Drug Bioequivalence (July 1974—Disk 5)

## Pollution

*See Environmental protection; Hazardous waste; Oceans and oceanography; Superfund; Waste management*

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## Remote sensing

*See also Climate change; Space*

Reducing the Costs of Collecting Meteorological Data: A Workshop Summary (June 1995)

Civilian Satellite Remote Sensing: A Strategic Approach (September 1994)

Remotely Sensed Data: Technology, Management and Markets (September 1994)

Data Format Standards for Civilian Remote Sensing Satellites (May 1993)

The Future of Remote Sensing From Space: Civilian Satellite Systems and Applications (July 1993)

Global Change Research and NASA's Earth Observing System (November 1993)

Remotely Sensed Data From Space: Distribution, Pricing, and Applications (July 1992)

Remote Sensing and the Private Sector: Issues for Discussion (March 1984—Disk 4)

## Research and development

*See also Agricultural technology; AIDS/HIV infection; Biological research and technology; Communications; Economic development; Information*

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*technology; Science and technology; Transportation*

The Effectiveness of Research and Experimentation Tax Credits (September 1995)
Foreign Eligibility for U.S. Technology Funding (September 1995)
A History of the Department of Defense Federally Funded Research and Development Centers (June 1995)
Information Systems Related to Technology Transfer: A Report on Federal Technology Transfer in the United States (September 1993)
Federally Funded Research: Decisions for a Decade (May 1991—Disk 2)
Proposal Pressure in the 1980s: An Indicator of Stress on the Federal Research System (April 1990—Disk 2)
Construction and Materials Research and Development for the Nation's Public Works (June 1987—Disk 3)
Research Funding as an Investment: Can We Measure the Returns? (April 1986—Disk 3)
Quality and Relevance of Research and Related Activities at the Gorges Memorial Laboratory (August 1983—Disk 4)
An Assessment of Technology for Local Development (January 1981—Disk 5)

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Government Involvement in the Innovation Process: A Contractor's Report to the Office of Technology Assessment (August 1978—Disk 5)
The Health of the Scientific and Technical Enterprise: An Advisory Panel Report to the Office of Technology Assessment (October 1978—Disk 5)
The Role of Demonstrations in Federal R&D Policy (July 1978—Disk 5)

## Science and technology

*See also Biological research and technology; Competitiveness; Computer technology; Economic development; Education; Information technology; Law and law enforcement technology; Research and development*

International Partnerships in Large Science Projects (July 1995)
Perspectives on the Role of Science and Technology in Sustainable Development (September 1994)
Biomedical Ethics in U.S. Public Policy (June 1993)

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Proceedings: Technology and Governance in the 1990s. Papers Presented at the OTA 20th Anniversary Forum on Technology and Governance in the 1990s (April 1993)

Biology, Medicine, and the Bill of Rights (September 1988—Disk 3)

Book Preservation Technologies (May 1988—Disk 3)

Science, Technology, and the First Amendment (January 1988—Disk 3)

Science, Technology, and the Constitution (September 1987—Disk 3)

The Regulatory Environment for Science (February 1986—Disk 3)

Global Models, World Futures, and Public Policy: A Critique (April 1982—Disk 4)

Impact of a Department of Education on Federal Science and Technology Activities (August 1978—Disk 5)

Technology Assessment in Business and Government (January 1977—Disk 5)

Technology Assessment Activities in the Industrial, Academic, and Governmental Communities (December 1976—Disk 5)

## Solar power

Solar Power Satellites (August 1981—Disk 5)

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Conservation and Solar Energy Programs of the Department of Energy: A Critique (June 1980—Disk 5)
Application of Solar Technology to Today's Energy Needs—Vol. I (June 1978—Disk 5)
Application of Solar Technology to Today's Energy Needs—Vol. II (September 1978—Disk 5)

## Space

*See also Climate change; Competitiveness; International relations and technology transfer; Remote sensing*

The Lower Tiers of the Space Transportation Industrial Base (August 1995)
The National Space Transportation Policy: Issues for Congress (June 1995)
U.S.-Russian Cooperation in Space (May 1995)
NASA's Office of Space Science and Applications: Process, Priorities and Goals (January 1992)
Exploring the Moon and Mars: Choices for the Nation (July 1991—Disk 2)
Access to Space: The Future of U.S. Space Transportation Systems (April 1990—Disk 2)

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Round Trip to Orbit: Human Spaceflight Alternatives (August 1989—Disk 2)
Launch Options for the Future: A Buyer's Guide (July 1988—Disk 3)
Reducing Launch Operation Costs: New Technologies and Practices (September 1988—Disk 3)
Commercial Newsgathering From Space (May 1987—Disk 3)
Space Stations and the Law: Selected Legal Issues (August 1986—Disk 3)
International Cooperation and Competition in Civilian Space Activities (June 1985—Disk 4)
U.S.-Soviet Cooperation in Space (July 1985—Disk 4)
Civilian Space Stations and the U.S. Future in Space (November 1984—Disk 4)
SALYUT: Soviet Steps Toward Permanent Human Presence in Space (December 1983—Disk 4)
UNISPACE '82: A Context for International Cooperation and Competition (March 1983—Disk 4)

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Civilian Space Policy and Applications (June 1982—Disk 4)
Space Science Research in the United States (September 1982—Disk 4)

## Substance abuse and addiction

*See also AIDS/HIV infection; Health and health technology; Pharmaceuticals*

Technologies for Understanding and Preventing Substance Abuse and Addiction (September 1994)
Biological Components of Substance Abuse and Addiction (September 1993)
The Effectiveness and Costs of Alcoholism Treatment (March 1983—Disk 4)

## Superconductors

*See also Materials*

High-Temperature Superconductivity in Perspective (April 1990—Disk 2)
Commercializing High-Temperature Superconductivity (June 1988—Disk 3)

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## Superfund

*See also Hazardous waste; Waste management*

Assessing Contractor Use in Superfund (January 1989—Disk 2)
Coming Clean: Superfund Problems Can Be Solved... (October 1989—Disk 2)
Are We Cleaning Up? 10 Superfund Case Studies (June 1988—Disk 3)
Superfund Strategy (April 1985—Disk 4)

## Telecommunications

*See also Communications; Computer technology; Information technology*

Telecommunications Technology and Native Americans: Opportunities and Challenges (August 1995)
Wireless Technologies and the National Information Infrastructure (September 1995)
U.S. Telecommunications Services in European Markets (August 1993)
U.S. Banks and International Telecommunications (October 1992)

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## Terrorism

*See Defense technology*

## Training

*See Education; Employment and training*

## Transportation

*See also Alternative fuels; Disabilities; Energy efficiency; Hazardous waste; Oceans and oceanography; Research and development*

Advanced Automotive Technology: Visions of a Super-Efficient Family Car (September 1995)

Federal Research and Technology for Aviation (September 1994)

Aircraft Evacuation Testing: Research and Technology Issues (September 1993)

Delivering the Goods: Public Works Technologies, Management, and Financing (April 1991—Disk 2)

Moving Ahead: 1991 Surface Transportation Legislation (June 1991—Disk 2)

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Safer Skies with TCAS: Traffic Alert and Collision Avoidance System—A Special Report (February 1989—Disk 2)
Gearing Up for Safety: Motor Carrier Safety in a Competitive Environment (September 1988—Disk 3)
Safe Skies for Tomorrow: Aviation Safety in a Competitive Environment (July 1988—Disk 3)
Transportation of Hazardous Materials (July 1986—Disk 3)
Transportation of Hazardous Materials: State and Local Activities (March 1986—Disk 3)
Alternative Approaches to Cargo Policy: A Supplement to an Assessment of Maritime Trade and Technology (August 1985—Disk 4)

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U.S. Passenger Rail Technologies (December 1983—Disk 4)
The Air Cargo System (January 1982—Disk 4)
Air Service to Small Communities (February 1982—Disk 4)
Airport and Air Traffic Control System (January 1982—Disk 4)
Financing and Program Alternatives for Advanced High-Speed Aircraft (August 1982—Disk 4)
Mandatory Passive Restraint Systems in Automobiles: Issues and Evidence (September 1982—Disk 4)
Review of the FAA 1982 National Airspace System Plan (August 1982—Disk 4)
Advanced High-Speed Aircraft (April 1980—Disk 5)
Impact of Advanced Group Rapid Transit Technology (January 1980—Disk 5)
Proceedings of the OTA Seminar on the Discrete Address Beacon System (DABS) (July 1980—Disk 5)
Railroad Safety—U.S.-Canadian Comparison (August 1979—Disk 5)

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Technology Assessment of Changes in the Future Use and Characteristics of the Automobile Transportation System—Volume I: Summary and Findings (February 1979—Disk 5)
Technology Assessment of Changes in the Future Use and Characteristics of the Automobile Transportation System—Volume II: Technical Report (February 1979—Disk 5)
Technology Assessment of Changes in the Future Use and Characteristics of the Automobile Transportation System—Volume III: Public Participation (October 1979—Disk 5)
An Evaluation of Railroad Safety (May 1978—Disk 5)
Transportation of Liquefied Natural Gas (September 1977—Disk 5)
Assessment of Community Planning for Mass Transit: Volume 10—Washington, D.C. Case Study (February 1976—Disk 5)
Assessment of Community Planning for Mass Transit: Volume 11—Technical Report (February 1976—Disk 5)
Assessment of Community Planning for Mass Transit: Volume 12—Bibliography (February 1976—Disk 5)

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Assessment of Community Planning for Mass Transit: Volume 2—Atlanta Case Study (February 1976—Disk 5)
Assessment of Community Planning for Mass Transit: Volume 3—Boston Case Study (February 1976—Disk 5)
Assessment of Community Planning for Mass Transit: Volume 4—Chicago Case Study (February 1976—Disk 5)
Assessment of Community Planning for Mass Transit: Volume 5—Denver Case Study (February 1976—Disk 5)
Assessment of Community Planning for Mass Transit: Volume 6—Los Angeles Case Study (February 1976—Disk 5)
Assessment of Community Planning for Mass Transit: Volume 7—Minneapolis-St. Paul Case Study (February 1976—Disk 5)
Assessment of Community Planning for Mass Transit: Volume 8—San Francisco Case Study (February 1976—Disk 5)
Assessment of Community Planning for Mass Transit: Volume 9—Seattle Case Study (February 1976—Disk 5)
Automatic Train Control in Rail Rapid Transit (May 1976—Disk 5)

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Automated Guideway Transit: An Assessment of PRT and Other New Systems (June 1975—Disk 5)
Automobile Collision Data: An Assessment of Needs and Methods of Acquisition (February 1975—Disk 5)
Energy, the Economy, and Mass Transit (October 1975—Disk 5)
Financial Viability of Conrail: Review and Analysis (September 1975—Disk 5)
A Review of Alternative Approaches to Federal Funding of Rail Rehabilitation (September 1975—Disk 5)
A Review of National Railroad Issues (December 1975—Disk 5)

## Waste management

*See also Environmental protection; Hazardous waste; Superfund*

State of the States on Brownfields: Programs for Cleanup and Reuse of Contaminated Sites (June 1995)
Managing Industrial Solid Wastes From Manufacturing, Mining, Oil and Gas Production, and Utility Coal Combustion (March 1992)
Facing America's Trash: What Next for Municipal Solid Waste? (October 1989—Disk 2)

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Materials and Energy From Municipal Waste (July 1979—Disk 5)

## Women's health

*See also Cancer; Health and health technology; Osteoporosis*

The Menopause, Hormone Therapy, and Women's Health (May 1992)

Review of a Protocol for a Study of Reproductive Health Outcomes Among Women Vietnam Veterans (December 1991—Disk 2)

Screening Mammography in Primary Care Settings: Implications for Cost Access and Quality (October 1991—Disk 2)

Artificial Insemination: Practice in the United States: Summary of a 1987 Survey (August 1988—Disk 3)

Infertility: Medical and Social Choices (May 1988—Disk 3)

Elective Hysterectomy: Costs, Risks, and Benefits (October 1981—Disk 5)

## Workplace safety and health

*See Environmental health*

*Jump to letter:*
A B C D E F
G-H I-K L M
N O P-Q R S
T-V W-Z

Office of Technology Assessment

# About This Disk...

## Help

How to use the search and navigation tools on these disks to find information in OTA reports

## Obtaining OTA reports

How to purchase paper and electronic copies of OTA reports and access the OTA Legacy Websites

## Production notes & credits

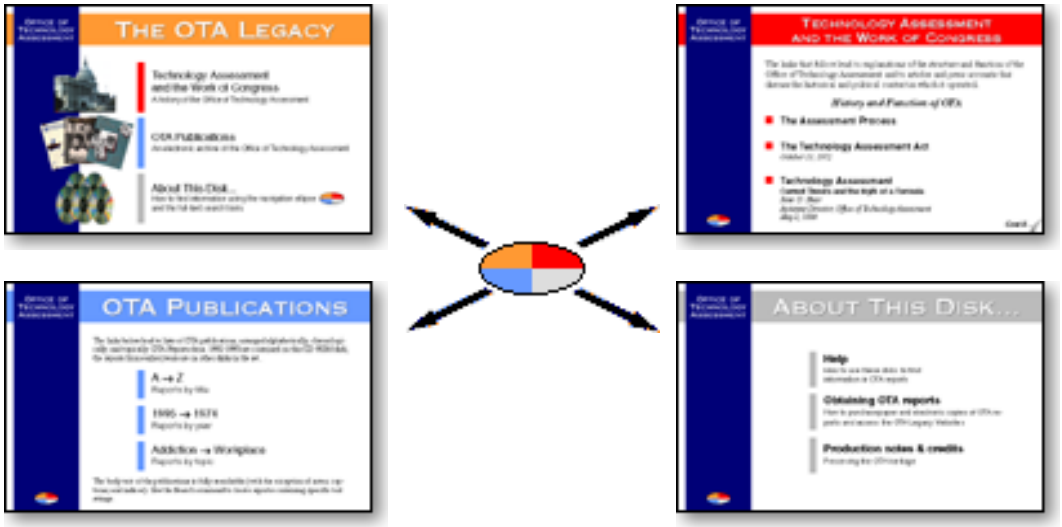
Preserving the OTA heritage



# About This Disk...

## Suggestions and Help

The main menu and the initial pages of the historical, publications, and help sections of the CD-ROM can be reached through the color-coded sections of the navigation ellipse found on every page.

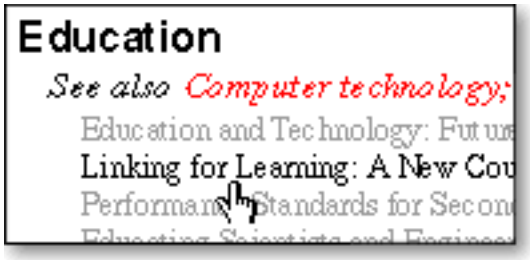



*Cont'd…*

# About This Disk...

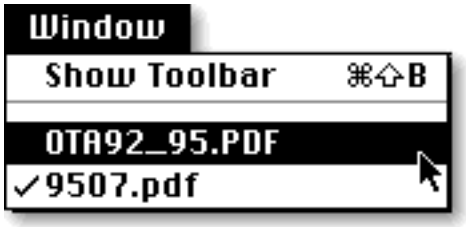
## Opening Reports

Open individual reports in separate windows by clicking on their titles in the lists on the blue publication pages. Titles displayed in gray rather than black are found on other disks in *The OTA Legacy* series. Terms in red are hyperlinks to other portions of this navigation document.




## Switching between Documents

Up to ten documents can be open simultaneously. To return to this navigational document, click one of thequadrants of the navigation ellipse found on the cover page of the report, or choose this document from the "Window" menu.




*Cont'd…*

# About This Disk...

## Toolbar

The controls in the toolbar at the top of the screen are the key to navigating quickly within documents on the CD-ROM. (If the toolbar doesn't appear on your screen, reveal it by using the "Show Toolbar" command under the "Windows" menu.)

## Bookmarks

Each report contains hypertext links or "bookmarks" connected to the beginning of chapters, appendices, and other major sections.




## Display format

The first three toolbar buttons control the display format. Normally, only images of the pages are shown. Choose the middle button to reveal the bookmarks, or the button on the right to show thumbnail images alongside the pages.



*Cont'd…*

# About This Disk...

## Move & zoom

Choose the left button (or the scroll bars) to move the page within the window and the magnifying glass buttons to zoom in for a closer look at the pages. The magnification can also be setwith the pop-up menu in the lower left corner of the screen.






The fonts used within the documents were originally chosen for readability on printed pages. If they are hard to read on screen, try using a higher magnification or printing the document.

## Set the page format

Choose the left button to display a view of the entire page, the middle button to display a full-height view of the page, and the right button to display a full-width view.



*Cont'd…*

# About This Disk...

## Jump to different pages

Choose the middle buttons to move forward or back one page, and the end buttons to move to the first or last page of the document. Jump to any page in the document by clicking on the page icon displayed in the lower left corner.






Pages within the document are numbered sequentially. Most OTA reports used separate pagination systems for the front matter and the main body of the text, and in addition many blank pages have been removed from the documents. For these reasons, theAcrobat page numbers do not usually correspond to the those listed in the tables of contents within the OTA documents.

## Retrace path

Choose the left button to go to the series of last pages visited, and then the right button to return along the same path to the current page.



*Cont'd…*

# About This Disk...

## Select and copy text

Choose this button to select text for copying to another application. This tool often selects text or graphics that span more than one column; to constrain the selection to a desired area, hold down the Option key (Macintosh) or Control key (Windows).




## Search for text

Choose the leftmost button to search for a word in the current document, and the second button to search for text in an index of all the OTA documents on the CD-ROM. The third button displays the results of a multi-document search, ranked in order of relevance. The remaining buttons jump to the next (or previous) occurrences of the term found by the search tool.

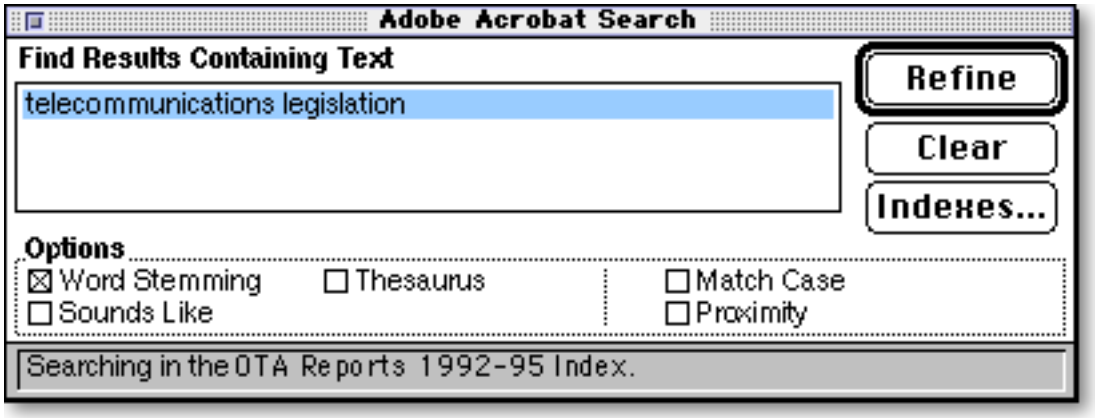


*Cont'd…*

# About This Disk...

## Full-Text Searches

The *search* button evokes a dialog box like the one below. When *word-stemming* option is enabled, a search will find all words with common stems. For instance, a search for "govern" will also find "government" and "governor". The *sounds-like* option finds words that are phonetically similar, such as "salmon" and "Solomon". The *match-case* option is not supported by the indices of OTA documents.




*Cont'd…*

# About This Disk...

## Search Indexes




The search command uses index files to track the location of information in the reports on each CD-ROM. This navigation document and all the OTA reports have been linked to the appropriate index, so for most users the proper index file will be available transparently whenever any OTA Acrobat document is open. Users with multiple CD-ROM drives may wish to search the full set of OTA documents simultaneously. To do so, manually link to the index files on the other disks in the OTA Legacy with the "Indexes" command. Additional information about using multiple CD-ROM drives can be found in the installation instructions.

## Further help

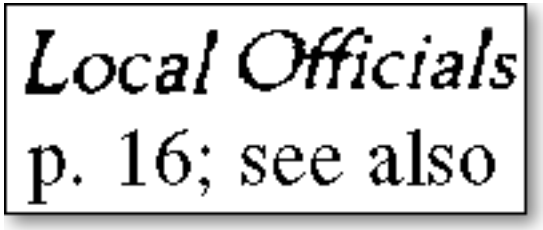
The menu commands for the Acrobat™ Reader and details about how to use the search function with wildcards, Boolean searches, and other strategies are more fully explained in the Reader Help document and the Search Help document. The stopword list used in the indices is found at the end of this document.

*Cont'd…*

# About This Disk...

## How these documents were prepared

Most of the documents in the OTA Legacy collection were converted from paper to Acrobat™ form using an optical character recognition (OCR) process. The reports were scanned, page by page, and then letters and words on the pages were recognized and turned into editable text. The OCR process maintains the layout of the original paper pages, including pictures, charts, and other graphics, but it performs poorly on text that is small or indistinct.




When the OCR process fails to recognize a word within a certain confidence level, it places an *image* of the word on top of its best guess for the recognized text.

The substitutions appear slightly "fuzzy", as in the words "Local Officials" in the image shown here, but they can still be easily read on screen or in a printed copy. A search for the word "local" would fail to locate it on the page shown here if the best guess (stored invisibly behind the image) is incorrect.

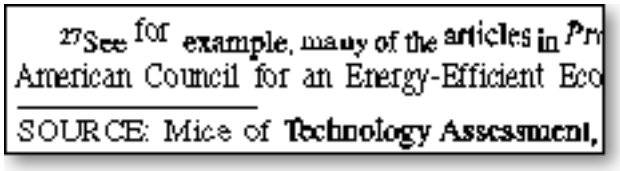
***Cont'd…***

# About This Disk...

## Problems you may encounter

OTA's goal has been to prepare readable, useable electronic versions of its publications within the limits of current technology. The agency's printed reports contain typographical and artistic elements that present substantial challenges for the OCR process, including small fonts, grayscale graphics, and sections of reports printed on shaded backgrounds. As a result, the documents contained on these discs are imperfect—but they are readable and useable. The sections that follow explain some of the problems that may be encountered within the documents.

### ■ Formatting & recognition errors




Most of the recognition errors have been corrected within the main body of the documents, but footnotes, captions, sidebars, and other parts of the text still contain such errors as well as others such as improperly assigned fonts, inaccurately applied italics or bolding, and errors in formatting.

*Cont'd…*

# About This Disk...

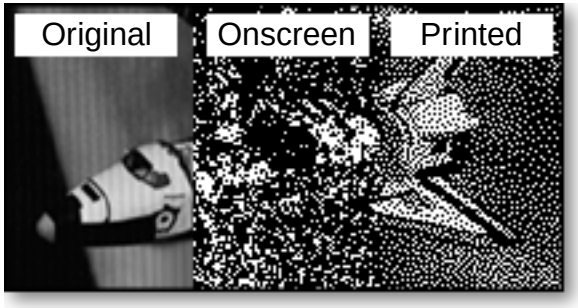
■ **Shaded backgrounds**

Some of the pages were printed on a gray background that was not amenable to text recognition through OCR. These pages have a speckled appearance and a large number of words replaced by images.




■ **Indistinct screen display**

Many reports contain photographs that were originally printed in shades of gray. The grayscale information could not be preserved; instead, these graphics are stored as high-resolution black and white images. They are displayed onscreen at much lower resolution and may appear blurred or indistinct, but printed versions are more faithful to the original images. (Small white bands may sometimes appear in printed copies.)

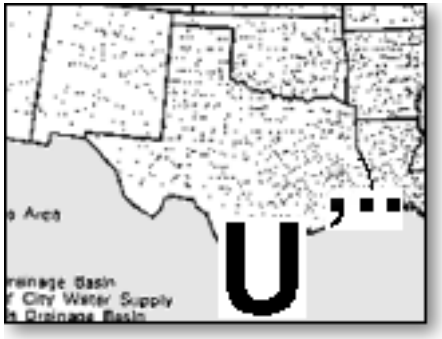



*Cont'd…*

# About This Disk...

- **Artifacts within graphics**

Occasionally, the OCR process “recognizes” text where it doesn't really exist, as in this sample where the lower tip of Texas has been converted into a large letter. Most of these errors have been removed, along with other common mistakes such as replacing lines of periods with asterisks or commas in tables of contents.




## Recent reports

More recent reports were converted directly into Acrobat format as part of the normal publishing process. Some of these reports contain a large number of custom fonts embedded within the document. Adobe recommends reserving a memory cache of 50K per font using the ATM™ control panel; if garbled text appears within the body of a report, try increasing the size of the ATM font cache.

# About This Disk...

## The OTA Legacy on the World Wide Web

Three separate institutions maintain archives of the OTA electronic publications:

**The Woodrow Wilson School of Public Policy, Princeton University**
http://www.wws.princeton.edu/~ota/

**Superintendent of Documents, U.S. Government Printing Office**
http://www.access.gpo.gov/ota/

**The National Academy of Sciences**
http://www.ota.nap.edu/

## GPO and NTIS

Paper copies of OTA reports and additional copies of the *The OTA Legacy: 1972-1995* CD-ROM set can be ordered through the the Superintendent of Documents of the Government Printing Office (GPO). Use the order form, call (202) 512-1800, or write:

Superintendent of Documents
U.S. Government Printing Office
P.O. Box 371954
Pittsburgh, PA 15250-7954

*Cont'd…*

# About This Disk...

OTA publications are also available in either paper or microfiche form from the National Technical Information Service (NTIS). To confirm prices and place an order, call (703) 487-4650 or (800) 553-NTIS.

## The Depository Library Program

Many OTA reports were distributed to Regional Depository Libraries throughout the country and may be included in the Government Documents collection of university and public libraries in your area. Consult your local librarian for additional information or contact:

Library Services Program
U.S. Government Printing Office
Washington, DC 20401-9325
(202) 512-1114

## U.S. Government Bookstores

GPO operates U.S. Government Bookstores around the country that stock some OTA titles and can special order any OTA report currently offered for sale. For more information, call one of the following bookstores:

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# About This Disk...

**Alabama**
U.S. Government Bookstore
O'Neill Building
2021 Third Avenue, North
Birmingham, AL 35203
Tel: (205) 731-1056
Fax: (205) 731-3444

**California**
U.S. Government Bookstore
ARCO Plaza, C-Level
505 South Flower Street
Los Angeles, CA 90071
Tel: (213) 239-9844
Fax: (213) 239-9848

U.S. Government Bookstore
Marathon Plaza, Room 141-S
303 2nd Street
San Francisco, CA 94107
Tel: (415) 512-2770
Fax: (415) 512-2776

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# About This Disk...

**Colorado**

U.S. Government Bookstore
Room 117, Federal Building
1961 Stout Street
Denver, CO 80294
Tel: (303) 844-3964
Fax: (303) 844-4000

U.S. Government Bookstore
Norwest Banks Building
201 West 8th Street
Pueblo, CO 81003
Tel: (719) 544-3142
Fax: (719) 544-6719

**District of Columbia**

U.S. Government Bookstore
U.S. Government Printing Office
710 North Capitol Street, NW
Washington, DC 20401
Tel: (202) 512-0132
Fax: (202) 512-1355

U.S. Government Bookstore
1510 H Street, NW
Washington, DC 20005
Tel: (202) 653-5075
Fax: (202) 376-5055

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**Florida**
U.S. Government Bookstore
100 West Bay Street, Suite 100
Jacksonville, FL 32202
Tel: (904) 353-0569
Fax: (904) 353-1280

**Georgia**
U.S. Government Bookstore
First Union Plaza
999 Peachtree Street, NE, Suite 120
Atlanta, GA 30309-3964
Tel: (404) 347-1900
Fax: (404) 347-1897

**Illinois**
U.S. Government Bookstore
One Congress Center
401 South State Street, Suite 124
Chicago, IL 60605
Tel: (312) 353-5133
Fax: (312) 353-1590

**Maryland**
U.S. Government Printing Office
Warehouse Sales Outlet
8660 Cherry Lane
Laurel, MD 20707
Tel: (301) 953-7974
Tel: (301) 792-0262
Fax: (301) 498-8995

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**Massachusetts**
U.S. Government Bookstore
Thomas P. O'Neill Building
10 Causeway Street, Room 169
Boston, MA 02222
Tel: (617) 720-4180
Fax: (617) 720-5753

**Michigan**
U.S. Government Bookstore
Suite 160, Federal Building
477 Michigan Avenue
Detroit, MI 48226
Tel: (313) 226-7816
Fax: (313) 226-4698

**Missouri**
U.S. Government Bookstore
120 Bannister Mall
5600 East Bannister Road
Kansas City, MO 64137
Tel: (816) 765-2256
Fax: (816) 765-8233

**New York**
U.S. Government Bookstore
Room 110, Federal Building
26 Federal Plaza
New York, NY 10278
Tel: (212) 264-3825
Fax: (212) 264-9318

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# About This Disk...

**Ohio**

U.S. Government Bookstore
Room 1653, Federal Building
1240 East 9th Street
Cleveland, OH 44199
Tel: (216) 522-4922
Fax: (216) 522-4714

U.S. Government Bookstore
Room 207, Federal Building
200 North High Street
Columbus, OH 43215
Tel: (614) 469-6956
Fax: (614) 469-5374

**Oregon**

U.S. Government Bookstore
1305 SW First Avenue
Portland, OR 97201-5801
Tel: (503) 221-6217
Fax: (503) 225-0563

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# About This Disk...

**Pennsylvania**

U.S. Government Bookstore
Robert Morris Building
100 North 17th Street
Philadelphia, PA 19103
Tel: (215) 636-1900
Fax: (215) 636-1903

U.S. Government Bookstore
Room 118, Federal Building
1000 Liberty Avenue
Pittsburgh, PA 15222
Tel: (412) 644-2721
Fax: (412) 644-4547

**Texas**

U.S. Government Bookstore
Room 1C50, Federal Building
1100 Commerce Street
Dallas, TX 75242
Tel: (214) 767-0076
Fax: (214) 767-3239

U.S. Government Bookstore
Texas Crude Building
801 Travis Street, Suite 120
Houston, TX 77002
Tel: (713) 228-1187
Fax: (713) 228-1186

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# About This Disk...

**Washington**
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Room 194, Federal Building
915 Second Avenue
Seattle, WA 98174
Tel: (206) 553-4270
Fax: (206) 553-6717

**Wisconsin**
U.S. Government Bookstore
Suite 150, Reuss Federal Plaza
310 West Wisconsin Avenue
Milwaukee, WI 53203
Tel: (414) 297-1304
Fax: (414) 297-1300





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***Cont'd…***

# About This Disk...

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The documents on the *OTA Legacy* CD-ROMs and websites represent 23 years of distinguished service to the Congress of the United States by more than 700 alumni of the Office of Technology Assessment and many thousands of outside contributors, reviewers, and advisors from the academic, governmental, business, and nonprofit communities.

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OFFICE OF TECHNOLOGY ASSESSMENT



CONGRESS OF THE UNITED STATES

# About This Disk...

**Recommended citation for this collection:** U.S. Congress, Office of Technology Assessment, *The OTA Legacy: 1972-1995*, (Washington, DC: U.S. Government Printing Office, February 1996).

Please cite quotations from specific reports individually. A recommended citation form is found on the second page of many of the reports. All OTA assessments and the navigational materials on this disk are in the public domain, but the historical articles and press accounts are protected by the copyrights held by the original publishers and may not be reproduced or distributed in electronic, paper, or any other form.

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# About This Disk...

## Stopword list

*Stopwords* are commonly-used words that are excluded from the indices used by the *Search* command in order to make searching for more substantive terms faster. Searches that include stopwords from the list below will fail, so avoid searching for phrases such as "trade *between* China *and* Thailand". In addition, numbers such as "1990" are not included in the indices.

| | | | |
|---|---|---|---|
| A | An | Before | From |
| a | an | before | from |
| About | And | Between | Further |
| about | and | between | further |
| Above | As | But | Here |
| above | as | but | here |
| After | At | By | However |
| after | at | by | however |
| Also | Be | Either | If |
| also | be | either | if |
| Although | Because | For | In |
| although | because | for | in |

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OFFICE OF TECHNOLOGY ASSESSMENT

# ABOUT THIS DISK...

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