NEXT

15 USC 3701

**Public Law 96-480, As Amended by Public Law 99-502 (October 20, 1986)**
"Federal Technology Transfer Act"

# An Act

To promote United States technological innovation for the achievement of national economic, environmental, and social goals, 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 "Stevenson-Wydler Technology Innovation Act of 1980".

SEC. 2. FINDINGS.

The Congress finds and declares that:

(1) Technology and industrial innovation are central to the economic, environmental, and social well-being of citizens of the United States.

(2) Technology and industrial innovation offer an improved standard of living, increased public and private sector productivity, creation of new industries and employment opportunities, improved public services and enhanced competitiveness of United States products in world markets.

(3) Many new discoveries and advances in science occur in universities and Federal laboratories, while the application of this new knowledge to commercial and useful public purposes depends largely upon actions by business and labor. Cooperation among academia, Federal laboratories, labor, and industry, in such forms as technology transfer, personnel exchange, joint research projects, and others, should be renewed, expanded, and strengthened.

(4) Small businesses have performed an important role in advancing industrial and technological innovation.

(5) Industrial and technological innovation in the United States may be lagging when compared to historical patterns and other industrialized nations.

(6) Increased industrial and technological innovation would reduce trade deficits, stabilize the dollar, increase productivity gains, increase employment, and stabilize prices.

(7) Government antitrust, economic, trade, patent, procurement, regulatory, research and development, and tax policies have significant impacts upon industrial innovation and development of technology, but there is insufficient knowledge of their effects in particular sectors of the economy.

(8) No comprehensive national policy exists to enhance technological innovation for commercial and public purposes. There is a need for such a policy, including a strong national policy supporting domestic technology transfer and utilization of the science and technology resources of the Federal Government.

(9) It is in the national interest to promote the adaptation of technological innovations to State and local government uses. Technological innovations can improve services, reduce their costs, and increase productivity in State and local governments.

(10) The Federal laboratories and other performers of federally funded research and development frequently provide scientific and technological developments of potential use to State and local governments and private industry. These developments *, which include inventions, computer software, and training technologies,* should be made accessible to those governments and industry. There is a need to provide means of access and to give adequate personnel and funding support to these means.

(11) The Nation should give fuller recognition to individuals and companies which have made outstanding contributions to the promotion of technology or technological manpower for the improvement of the economic, environmental, or social well-being of the United States.

SEC. 3. PURPOSE.

It is the purpose of this Act to improve the economic, environmental, and social well-being of the United States by—

(1) establishing organizations in the executive branch to study and stimulate technology;

(2) promoting technology development through the establishment of ~~centers for industrial technology~~ *cooperative research centers*;

(3) stimulating improved utilization of federally funded technology developments *, including inventions, software, and training technologies,* by State and local governments and the private sector;

(4) providing encouragement for the development of technology through the recognition of individuals and companies which have made outstanding contributions in technology; and

(5) encouraging the exchange of scientific and technical personnel among academia, industry, and Federal laboratories.

SEC. 4. DEFINITIONS.

As used in this Act, unless the context otherwise requires, the term—

(1) "Office" means the Office of ~~Industrial Technology~~ *Productivity, Technology, and Innovation* ~~estab-~~ lished under section 5 of this Act.

(2) "Secretary" means the Secretary of Commerce.

(3) ~~"Director" means the Director of the Office of Industrial Technology~~ *'Assistant Secretary' means the Assistant Secretary for Productivity, Technology, and Innovation*, appointed pursuant to section 5 of this Act.

(4) "Centers" means the ~~Centers for Industrial Technology~~ *Cooperative Research Centers* established under section 6 or section 8 of this Act.

(5) "Nonprofit institution" means an organization owned and operated exclusively for scientific or educational purposes, no part of the net earnings of which inures to the benefit of any private shareholder or individual.

~~(6) "Board" means the National Industrial Technology Board established pursuant to section 10.~~

*(6)* ~~(7)~~ "Federal laboratory" means any laboratory, any federally funded research and development center, or any center established under section 6 or section 8 of this Act that is ~~owned and funded~~ *owned, leased, or otherwise used by a Federal agency and funded* by the Federal Government, whether operated by the Government or by a contractor.

*(7)* ~~(8)~~ "Supporting agency" means either the Department of Commerce or the National Science Foundation, as appropriate.

*"(8) 'Federal agency' means any executive agency as defined in section 105 of title 5, United States Code, and the military departments as defined in section 102 of such title.*

*"(9) 'Invention' means any invention or discovery which is or may be patentable or otherwise protected under title 35, United States Code, or any novel variety of plant which is or may be protectable under the Plant Variety Protection Act (7 U.S.C. 2321 et seq.).*

*"(10) 'Made' when used in conjunction with any invention means the conception or first actual reduction to practice of such invention.*

*"(11) 'Small business firm' means a small business concern as defined in section 2 of Public Law 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration.*

*"(12) 'Training technology' means computer software and related materials which are developed by a Federal agency to train employees of such agency, including but not limited to software for computer-based instructional systems and for interactive video disc systems.*

**SEC. 5. COMMERCE AND TECHNOLOGICAL INNOVATION.**

(a) IN GENERAL.—The Secretary shall establish and maintain an Office of ~~Industrial Technology~~ *Productivity, Technology, and Innovation* in accordance with the provisions, findings, and purposes of this Act.

(b) ~~DIRECTOR~~ *ASSISTANT SECRETARY.*—The President shall appoint, by and with the advice and consent of the Senate, ~~a Director of the Office, who shall be compensated at the rate provided for level V of the Executive Schedule in section 5316 of title 5, United States Code~~ *an Assistant Secretary for Productivity, Technology, and Innovation*.

(c) DUTIES.—The Secretary, through ~~the Director~~ *the Assistant Secretary* on a continuing basis, shall—

(1) determine the relationships of technological developments and international technology transfers to the output, employment, productivity, and world trade performance of United States and foreign industrial sectors;

(2) determine the influence of economic, labor and other conditions, industrial structure and management, and government policies on technological developments in particular industrial sectors worldwide;

(3) identify technological needs, problems, and opportunities within and across industrial sectors that, if addressed, could make a significant contribution to the economy of the United States;

(4) assess whether the capital, technical and other resources being allocated to domestic industrial sectors which are likely to generate new technologies are adequate to meet private and social demands for goods and services and to promote productivity and economic growth;

(5) propose and support studies and policy experiments, in cooperation with other Federal agencies, to determine the effectiveness of measures with the potential of advancing United States technological innovation;

(6) provide that cooperative efforts to stimulate industrial innovation be undertaken between ~~the Director~~ *the Assistant Secretary* and other officials in the Department of Commerce responsible for such areas as trade and economic assistance;

*"(7) encourage and assist the creation of centers and other joint initiatives by State of local governments, regional organizations, private businesses, institutions of higher education, nonprofit organizations, or Federal laboratories to encourage technology transfer, to stimulate innovation, and to promote an appropriate climate for investment in technology-related industries;*

*"(8) propose and encourage cooperative research involving appropriate Federal entities, State or local governments, regional organizations, colleges or universities, nonprofit organizations, or private industry to promote the common use of resources, to improve training programs and curricula, to stimulate interest in high technology careers, and to encourage the effective dissemination of technology skills within the wider community;*

(9) (7) consider government measures with the potential of advancing United States technological innovation and exploiting innovations of foreign origin; and

(10) (8) publish the results of studies and policy experiments.

(d) REPORT.—The Secretary shall prepare and submit to the President and Congress, within 3 years after the date of enactment of this Act, a report on the progress, findings, and conclusions of activities conducted pursuant to sections 5, 6, 8, 11, 12, and 13 of this Act *(as then in effect)* and recommendations for possible modifications thereof.

~~SEC. 6. CENTERS FOR INDUSTRIAL TECHNOLOGY.~~

*SEC. 6. COOPERATIVE RESEARCH CENTERS.*

(a) ESTABLISHMENT.—The Secretary shall provide assistance for the establishment of ~~Centers for Industrial Technology.~~ *Cooperative Research Centers.* Such Centers shall be affiliated with any university, or other nonprofit institution, or group thereof, that applies for and is awarded a grant or enters into a cooperative agreement under this section. The objective of the Centers is to enhance technological innovation through—

(1) the participation of individuals from industry and universities in cooperative technological innovation activities;

(2) the development of the generic research base, important for technological advance and innovative activity, in which individual firms have little incentive to invest, but which may have significant economic or strategic importance, such as manufacturing technology;

(3) the education and training of individuals in the technological innovation process;

(4) the improvement of mechanisms for the dissemination of scientific, engineering, and technical information among universities and industry;

(5) the utilization of the capability and expertise, where appropriate, that exists in Federal laboratories; and

(6) the development of continuing financial support from other mission agencies, from State and local government, and from industry and universities through, among other means, fees, licenses, and royalties.

(b) ACTIVITIES.—The activities of the Centers shall include, but need not be limited to—

(1) research supportive of technological and industrial innovation including cooperative industry-university ~~basic and applied~~ research;

(2) assistance to individuals and small businesses in the generation, evaluation and development of technological ideas supportive of industrial innovation and new business ventures;

(3) technical assistance and advisory services to industry, particularly small businesses; and

(4) curriculum development, training, and instruction in invention, entrepreneurship, and industrial innovation.

Each Center need not undertake all of the activities under this subsection.

(c) REQUIREMENTS.—Prior to establishing a Center, the Secretary shall find that—

(1) consideration has been given to the potential contribution of the activities proposed under the Center to productivity, employment, and economic competitiveness of the United States;

(2) a high likelihood exists of continuing participation, advice, financial support, and other contributions from the private sector;

(3) the host university or other nonprofit institution has a plan for the management and evaluation of the activities proposed within the particular Center, including:

(A) the agreement between the parties as to the allocation of patent rights on a nonexclusive, partially exclusive, or exclusive license basis to and inventions conceived or made under the auspices of the Center; and

(B) the consideration of means to place the Center, to the maximum extent feasible, on a self-sustaining basis;

(4) suitable consideration has been given to the university's or other nonprofit institution's capabilities and geographical location; and

(5) consideration has been given to any effects upon competition of the activities proposed under the Center.

(d) PLANNING GRANTS.—The Secretary is authorized to make available nonrenewable planning grants to universities or nonprofit institutions for the purpose of developing a plan required under subsection (c)(3).

~~(e) RESEARCH AND DEVELOPMENT UTILIZATION. (1) To promote technological innovation and commercialization of research and development efforts, each Center has the option of acquiring title to any invention conceived or made under the auspices of the Center that was supported at least in part by Federal funds: *Provided*, That—~~

(A) the Center reports the invention to the supporting agency together with a list of each country in which the Center elects to file a patent application on the invention;

(B) said option shall be exercised at the time of disclosure of invention or within such time thereafter as may be provided in the grant or cooperative agreement;

(C) the Center intends to promote the commercialization of the invention and file a United States patent application;

(D) royalties be used for compensation of the inventor or for educational or research activities of the Center;

(E) the Center make periodic reports to the supporting agency, and the supporting agency may treat information contained in such reports as privileged and confidential technical, commercial, and financial information and not subject to disclosures under the Freedom of Information Act; and

(F) any Federal department or agency shall have the royalty-free right to practice, or have practiced on its behalf, the invention for governmental purposes.

The supporting agency shall have the right to acquire title to any patent on an invention in any country in which the Center elects not to file a patent application or fails to file within a reasonable time.

(2) Where a Center has retained title to an invention under paragraph (1) of this subsection the supporting agency shall have the right to require the Center or its licensee to grant a nonexclusive, partially exclusive, or exclusive license to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, if the supporting agency determines, after public notice and opportunity for hearing, that such action is necessary—

(A) because the Center or licensee has not taken and is not expected to take timely and effective action to achieve practical application of the invention;

(B) to meet health, safety, environmental, or national security needs which are not reasonably satisfied by the contractor or licensee; or

(C) because the granting of exclusive rights in the invention has tended substantially to lessen competition or to result in undue market concentration in the United States in any line of commerce to which the technology relates.

~~(3) Any individual, partnership, corporation, association, institution, or other entity adversely affected by a supporting agency determination made under paragraph (2) of this subsection may, at any time within 60 days after the determination is issued, file a petition to the United States Court of Claims which shall have jurisdiction to determine that matter de novo and to affirm, reverse, or modify as appropriate, the determination of the supporting agency.~~

*(e) RESEARCH AND DEVELOPMENT UTILIZATION.—In the promotion of technology from research and development efforts by Centers under this section, chapter 18 of title 35, United States Code, shall apply to the extent not inconsistent with this section.*

~~(f) ADDITIONAL CONSIDERATION. The supporting agency may request the Attorney General's opinion whether the proposed joint research activities of a Center would violate any of the antitrust laws. The Attorney General shall advise the supporting agency of his determination and the reasons for it within 120 days after receipt of such request.~~

SEC. 7. GRANTS AND COOPERATIVE AGREEMENTS.

(a) IN GENERAL.—The Secretary may make grants and enter into cooperative agreements according to the provisions of this section in order to assist any activity consistent with this Act, including activities performed by individuals. The total amount of any such grant or cooperative agreement may not exceed 75 percent of the total cost of the program.

(b) ELIGIBILITY AND PROCEDURE.—Any person or institution may apply to the Secretary for a grant or cooperative agreement available under this section. Application shall be made in such form and manner, and with such content and other submissions, as the Director shall prescribe. The Secretary shall act upon each such application within 90 days after the date on which all required information is received.

Note: "Director" should have been replaced by"Assistan Secretary"-- see Section 4(3).

(c) TERMS AND CONDITIONS.—

(1) Any grant made, or cooperative agreement entered into, under this section shall be subject to the limitations and provisions set forth in paragraph (2) of this subsection, and to such other terms, conditions, and requirements as the Secretary deems necessary or appropriate.

(2) Any person who receives or utilizes any proceeds of any grant made or cooperative agreement entered into under this section shall keep such records as the Secretary shall by regulation prescribe as being necessary and appropriate to facilitate effective audit and evaluation, including records which fully disclose the amount and disposition by such recipient of such proceeds, the total cost of the program or project in connection with which such proceeds were used, and the amount, if any, of such costs which was provided through other sources.

SEC. 8. NATIONAL SCIENCE FOUNDATION ~~CENTERS FOR INDUSTRIAL TECHNOLOGY.~~ *COOPERATIVE RESEARCH CENTERS*.

(a) ESTABLISHMENT AND PROVISIONS.—The National Science Foundation shall provide assistance for the establishment of ~~Centers for Industrial Technology.~~ *Cooperative Research Centers*. Such Centers shall be affiliated with a university, or other nonprofit institution, or a group thereof. The objective of the Centers is to enhance technological innovation as provided in section 6(a) through the conduct of activities as provided in section 6(b). ~~The provisions of sections 6(e) and 6(f) shall apply to Centers established under this section.~~

(b) PLANNING GRANTS.—The National Science Foundation is authorized to make available nonrenewable planning grants to universities or nonprofit institutions for the purpose of developing the plan, as described under section 6(c)(3).

(c) TERMS AND CONDITIONS.—Grants, contracts, and cooperative agreements entered into by the National Science Foundation in execution of the powers and duties of the National Science Foundation under this Act shall be governed by the National Science Foundation Act of 1950 and other pertinent Acts.

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SEC. 9. ADMINISTRATIVE ARRANGEMENTS.

(a) COORDINATION.—The Secretary and the National Science Foundation shall, on a continuing basis, obtain the advice and cooperation of departments and agencies whose missions contribute to or are affected by the programs established under this Act, including the development of an agenda for research and policy experimentation. These departments and agencies shall include but not be limited to the Departments of Defense, Energy, Education, Health and Human Services, Housing and Urban Development, the Environmental Protection Agency, National Aeronautics and Space Administration, Small Business Administration, Council of Economic Advisers, Council on Environmental Quality, and Office of Science and Technology Policy.

(b) COOPERATION.—It is the sense of the Congress that departments and agencies, including the Federal laboratories, whose missions are affected by, or could contribute to, the programs established under this Act, should, within the limits of budgetary authorizations and appropriations, support or participate in activities or projects authorized by this Act.

(c) ADMINISTRATIVE AUTHORIZATION.—

(1) Departments and agencies described in subsection (b) are authorized to participate in, contribute to, and serve as resources for the Centers and for any other activities authorized under this Act.

(2) The Secretary and the National Science Foundation are authorized to receive moneys and to receive other forms of assistance from other departments or agencies to support activities of the Centers and any other activities authorized under this Act.

(d) COOPERATIVE EFFORTS.—The Secretary and the National Science Foundation shall, on a continuing basis, provide each other the opportunity to comment on any proposed program of activity under section 6, 8, ~~or 13~~ *10, 14, or 16* of this Act before funds are committed to such program in order to mount complementary efforts and avoid duplication.

~~SEC. 10. NATIONAL INDUSTRIAL TECHNOLOGY BOARD.~~

~~(a) ESTABLISHMENT.—There shall be established a committee to be known as the National Industrial Technology Board.~~

~~(b) DUTIES.—The Board shall take such steps as may be necessary to review annually the activities of the Office and advise the Secretary and the Director with respect to—~~

~~(1) the formulation and conduct of activities under section 5 of this title;~~

~~(2) the designation and operation of Centers and their programs under section 6 of this Act including assistance in establishing priorities;~~

~~(3) the preparation of the report required under section 5(d); and~~

~~(4) such other matters as the Secretary or Director refers to the Board, including the establishment of Centers under section 8 of this Act, for review and advice.~~

~~The Director shall make available to the Board such information, personnel, and administrative services and assistance as it may reasonably require to carry out its duties. The National Science Foundation shall make available to the Board such information and assistance as it may reasonably require to carry out its duties.~~

~~(c) MEMBERSHIP, TERMS, AND POWERS.—~~

~~(1) The Board shall consist of 15 voting members who shall be appointed by the Secretary. The Director shall serve as a nonvoting member of the Board. The members of the Board shall be individuals who, by reason of knowledge, experience, or training are especially qualified in one or more of the disciplines and fields dealing with technology, labor, and industrial innovation or who are affected by technological innovation. The majority of the members of the Board shall be individuals from industry and business.~~

~~(2) The term of office of a voting member of the Board shall be 3 years, except that of the original appointees, five shall be appointed for a term of 1 year, five shall be appointed for a term of 2 years, and five shall be appointed for a term of 3 years.~~

~~(3) Any individual appointed to fill a vacancy occurring before the expiration of the term for which his or her predecessor was appointed shall be appointed only for the remainder of such term. No individual may be appointed as a voting member after serving more than two full terms as such a member.~~

~~(4) The Board shall select a voting member to serve as the Chairperson and another voting member to serve as the Vice Chairperson. The Vice Chairperson shall perform the functions of the Chairperson in the absence or incapacity of the Chairperson.~~

~~(5) Voting members of the Board may receive compensation at a daily rate for GS–18 of the General Schedule under section 5332 of title 5, United States Code, when actually engaged in the performance of duties for such Board, and may be reimbursed for actual and reasonable expenses incurred in the performance of such duties.~~

SEC. ~~11.~~ UTILIZATION OF FEDERAL TECHNOLOGY.

(a) POLICY.—*(1)* It is the continuing responsibility of the Federal Government to ensure the full use of the results of the Nation's Federal investment in research and development. To this end the Federal Government shall strive where appropriate to transfer federally owned or originated technology to State and local governments and to the private sector.

*(2) Technology transfer, consistent with mission responsibilities, is a responsibility of each laboratory science and engineering professional.*

*(3) Each laboratory director shall ensure that efforts to transfer technology are considered positively in laboratory job descriptions, employee promotion policies, and evaluation of the job performance of scientists and engineers in the laboratory.*

(b) ESTABLISHMENT OF RESEARCH AND TECHNOLOGY APPLICATIONS OFFICES.—Each Federal laboratory shall establish an Office of Research and Technology Applications. Laboratories having existing organizational structures which perform the functions of this section may elect to combine the Office of Research and Technology Applications within the existing organization. The staffing and funding levels for these offices shall be determined between each Federal laboratory and the Federal agency operating or directing the laboratory, except that (1) each laboratory having ~~a total annual budget exceeding $20,000,000 shall provide at least one professional individual full time~~ *200 or more full-time equivalent scientific, engineering, and related technical positions shall provide one or more full-time equivalent positions* as staff for its Office of Research and Technology Applications, and (2) after September 30, 1981, each Federal agency which operates or directs one or more Federal laboratories shall make available not less than 0.5 percent of the agency's research and development budget to support the technology transfer function at the agency and at its laboratories, including support of the Offices of Research and Technology Applications.

*Furthermore, individuals filling positions in an Office of Research and Technology Applications shall be included in the overall laboratory/agency management development program so as to ensure that highly competent technical managers are full participants in the technology transfer process.*

The agency head may waive the ~~requirements set forth in (1) and/or (2) of this subsection.~~ *requirement set forth in clause (2) of the preceding sentence.* If the agency head waives ~~either requirement (1) or (2),~~ *such requirement,* the agency head shall submit to Congress at the time the President submits the budget to Congress an explanation of the reasons for the waiver and alternate plans for conducting the technology transfer function at the agency.

(c) FUNCTIONS OF RESEARCH AND TECHNOLOGY APPLICATIONS OFFICES.—It shall be the function of each Office of Research and Technology Applications—

~~(1) to prepare an application assessment of each research and development project in which that laboratory is engaged which has potential for successful application in State or local government or in private industry;~~

*(1) to prepare application assessments for selected research and development projects in which that laboratory is engaged and which in the opinion of the laboratory may have potential commercial applications;*

(2) to provide and disseminate information on federally owned or originated products, processes, and services having potential application to State and local governments and to private industry;

(3) to cooperate with and assist the ~~Center for the Utilization of Federal Technology~~ *National Technical Information Service, the Federal Laboratory Consortium for Technology Transfer,* and other organizations which link the research and development resources of that laboratory and the Federal Government as a whole to potential users in State and local government and private industry; ~~and~~

(4) to provide technical assistance ~~in response to requests from State and local government officials.~~ *to State and local government officials; and*

*"(5) to participate, where feasible, in regional, State, and local programs designed to facilitate or stimulate the transfer of technology for the benefit of the region, State, or local jurisdiction in which the Federal laboratory is located.*

Agencies which have established organizational structures outside their Federal laboratories which have as their principal purpose the transfer of federally owned or originated technology to State and local government and to the private sector may elect to perform the functions of this subsection in such organizational structures. No Office of Research and Technology Applications or other organizational structures performing the functions of this subsection shall substantially compete with similar services available in the private sector.

~~(d) CENTER FOR THE UTILIZATION OF FEDERAL TECHNOLOGY.—There is hereby established in the Department of Commerce a Center for the Utilization of Federal Technology. The Center for the Utilization of Federal Technology shall—~~

*(d) DISSEMINATION OF TECHNICAL INFORMATION.—The National Technical Information Service shall—*

(1) serve as a central clearinghouse for the collection, dissemination and transfer of information on federally owned or originated technologies having potential application to State and local governments and to private industry;

~~(2) coordinate the activities of the Offices of Research and Technology Applications of the Federal laboratories;~~

*(2)* ~~(3)~~ utilize the expertise and services of the National Science Foundation and the ~~existing~~ Federal Laboratory Consortium for Technology Transfer; particularly in dealing with State and local governments;

~~(4) receive requests for technical assistance from State and local governments and refer these requests to the appropriate Federal laboratories;~~

*"(3) receive requests for technical assistance from State and local governments, respond to such requests with published information available to the Service, and refer such requests to the Federal Laboratory Consortium for Technology Transfer to the extent that such requests require a response involving more than the published information available to the Service;*

*(4)* ~~(5)~~ provide funding, at the discretion of the Secretary, for Federal laboratories to provide the assistance specified in subsection ~~(c)(4)~~;

*(c)(3)* and

*(5)* ~~(6)~~ use appropriate technology transfer mechanisms such as personnel exchanges and computer-based systems.

*"(e) ESTABLISHMENT OF FEDERAL LABORATORY CONSORTIUM FOR TECHNOLOGY TRANSFER.—(1) There is hereby established the Federal Laboratory Consortium for Technology Transfer (hereinafter referred to as the 'Consortium') which, in cooperation with Federal laboratories and the private sector, shall—*

*"(A) develop and (with the consent of the Federal laboratory concerned) administer techniques, training courses, and materials concerning technology transfer to increase the awareness of Federal laboratory employees regarding the commercial potential of laboratory technology and innovations;*

*"(B) furnish advice and assistance requested by Federal agencies and laboratories for use in their technology transfer programs (including the planning of seminars for small business and other industry);*

*"(C) provide a clearinghouse for requests, received at the laboratory level, for technical assistance from States and units of local governments, businesses, industrial development organizations, not-for-profit organizations including universities, Federal agencies and laboratories, and other persons, and—*

*"(i) to the extent that such requests can be responded to with published information available to the National Technical Information Service, refer such requests to that Service, and*

*"(ii) otherwise refer these requests to the appropriate Federal laboratories and agencies;*

*"(D) facilitate communication and coordination between Offices of Research and Technology Applications of Federal laboratories;*

*"(E) utilize (with the consent of the agency involved) the expertise and services of the National Science Foundation, the Department of Commerce, the National Aeronautics and Space Administration, and other Federal agencies, as necessary;*

*"(F) with the consent of any Federal laboratory, facilitate the use by such laboratory of appropriate technology transfer mechanisms such as personnel exchanges and computer-based systems;*

*"(G) with the consent of any Federal laboratory, assist such laboratory to establish programs using technical volunteers to provide technical assistance to communities related to such laboratory;*

*"(H) facilitate communication and cooperation between Offices of Research and Technology Applications of Federal laboratories and regional, State, and local technology transfer organizations;*

*"(I) when requested, assist colleges or universities, businesses, nonprofit organizations, State or local governments, or regional organizations to establish programs to stimulate research and to encourage technology transfer in such areas as technology program development, curriculum design, long-term research planning, personnel needs projections, and productivity assessments; and*

*"(J) seek advice in each Federal laboratory consortium region from representatives of State and local governments, large and small business, universities, and other appropriate persons on the effectiveness of the program (and any such advice shall be provided at no expense to the Government).*

*"(2) The membership of the Consortium shall consist of the Federal laboratories described in clause (1) of subsection (b) and such other laboratories as may choose to join the Consortium. The representatives to the Consortium shall include a senior staff member of each Federal laboratory which is a member of the Consortium and a representative appointed from each Federal agency with one or more member laboratories.*

*"(3) The representatives to the Consortium shall elect a Chairman of the Consortium.*

*"(4) The Director of the National Bureau of Standards shall provide the Consortium, on a reimbursable basis, with administrative services, such as office space, personnel, and support services of the Bureau, as requested by the Consortium and approved by such Director.*

*"(5) Each Federal laboratory or agency shall transfer technology directly to users or representatives of users, and shall not transfer technology directly to the Consortium. Each Federal laboratory shall conduct and transfer technology only in accordance with the practices and policies of the Federal agency which owns, leases, or otherwise uses such Federal laboratory.*

*"(6) Not later than one year after the date of the enactment of this subsection, and every year thereafter, the Chairman of the Consortium shall submit a report to the President, to the appropriate authorization and appropriation committees of both Houses of the Congress, and to each agency with respect to which a transfer of funding is made (for the fiscal year or years involved) under paragraph (7), concerning the activities of the Consortium and the expenditures made by it under this subsection during the year for which the report is made.*

*"(7)(A) Subject to subparagraph (B), and amount equal to 0.005 percent of that portion of the research and development budget of each Federal agency that is to be utilized by the laboratories of such agency for a fiscal year referred to in subparagraph (B)(ii) shall be transferred by such agency to the National Bureau of Standards at the beginning of the fiscal year involved. Amounts so transferred shall be provided by the Bureau to the Consortium for the purpose of carrying out activities of the Consortium under this subsection.*

*"(B) A transfer shall be made by any Federal agency under subparagraph (A), for any fiscal year, only if—*

*"(i) the amount so transferred by that agency (as determined under such subparagraph) would exceed $10,000; and*

*"(ii) such transfer is made with respect to the fiscal year 1987, 1988, 1989, 1990, or 1991.*

*"(C) The heads of Federal agencies and their designees, and the directors of Federal laboratories, may provide such additional support for operations of the Consortium as they deem appropriate.*

*"(8) (A) The Consortium shall use 5 percent of the funds provided in paragraph (7)(A) to establish demonstration projects in technology transfer. To carry out such projects, the Consortium may arrange for grants or awards to, or enter into agreements with, nonprofit State, local, or private organizations or entities whose primary purposes are to facilitate cooperative research between the Federal laboratories and organizations not associated with the Federal laboratories, to transfer technology from the Federal laboratories, and to advance State and local economic activity.*

*"(B) The demonstration projects established under subparagraph (A) shall serve as model programs. Such projects shall be designed to develop programs and mechanisms for technology transfer from the Federal laboratories which may be utilized by the States and which will enhance Federal, State and local programs for the transfer of technology.*

*"(C) Application for such grants, awards, or agreements shall be in such form and contain such information as the Consortium or its designee shall specify.*

*"(D) Any person who receives or utilizes any proceeds of a grant or award made, or agreement entered into, under this paragraph shall keep such records as the Consortium or its designee shall determine are necessary and appropriate to facilitate effective audit and evaluation, including records which fully disclose the amount and disposition of such proceeds and the total cost of the project in connection with which such proceeds were used.*

*(f)* ~~(e)~~ AGENCY REPORTING.—Each Federal agency which operates or directs one or more Federal laboratories shall ~~prepare biennially a report summarizing the activities~~ *report annually to the Congress, as part of the agency's annual budget submission, on the activities* performed by that agency and its Federal laboratories pursuant to the provisions of this section. ~~The report shall be transmitted to the Center for the Utilization of Federal Technology by November 1 of each year in which it is due.~~

*(g) FUNCTIONS OF THE SECRETARY.—(1) The Secretary, in consultation with other Federal agencies, may—*

*"(A) make available to interested agencies the expertise of the Department of Commerce regarding the commercial potential of inventions and methods and options for commercialization which are available to the Federal laboratories, including research and development limited partnerships;*

*"(B) develop and disseminate to appropriate agency and laboratory personnel model provisions for use on a voluntary basis in cooperative research and development arrangements; and*

*"(C) furnish advice and assistance, upon request, to Federal agencies concerning their cooperative research and development programs and projects.*

*"(2) Two years after the date of the enactment of this subsection and every two years thereafter, the Secretary shall submit a summary report to the President and the Congress on the use by the agencies and the Secretary of the authorities specified in this Act. Other Federal agencies shall cooperate in the report's preparation.*

*"(3) Not later than one year after the date of the enactment of the Federal Technology Transfer Act of 1986, the Secretary shall submit to the President and the Congress a report regarding—*

*"(A) any copyright provisions or other types of barriers which tend to restrict or limit the transfer of federally funded computer software to the private sector and to State and local governments, and agencies of such State and local governments; and*

*"(B) the feasibility and cost of compiling and maintaining a current and comprehensive inventory of all federally funded training software.*

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*"SEC. ~~12~~ COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS.*

*"(a) GENERAL AUTHORITY.—Each Federal agency may permit the director of any of its Government-operated Federal laboratories—*

*"(1) to enter into cooperative research and development agreements on behalf of such agency (subject to subsection (c) of this section) with other Federal agencies; units of State or local government; industrial organizations (including corporations, partnerships, and limited partnerships, and industrial development organizations); public and private foundations; nonprofit organizations (including universities); or other persons (including licensees of inventions owned by the Federal agency); and*

*"(2) to negotiate licensing agreements under section 207 of title 35, United States Code, or under other authorities for Government-owned inventions made at the laboratory and other inventions of Federal employees that may be voluntarily assigned to the Government.*

*"(b) ENUMERATED AUTHORITY.—Under agreements entered into pursuant to subsection (a)(1), a Government-operated Federal laboratory may (subject to subsection (c) of this section)—*

*"(1) accept, retain, and use funds, personnel, services, and property from collaborating parties and provide personnel, services, and property to collaborating parties;*

*"(2) grant or agree to grant in advance, to a collaborating party, patent licenses or assignments, or options thereto, in any invention made in whole or in part by a Federal employee under the agreement, retaining a nonexclusive, nontransferrable, irrevocable, paid-up license to practice the invention or have the invention practiced throughout the world by or on behalf of the Government and such other rights as the Federal laboratory deems appropriate; and*

*"(3) waive, subject to reservation by the Government of a nonexclusive, irrevocable, paid-up license to practice the invention or have the invention practiced throughout the world by or on behalf of the Government, in advance, in whole or in part, any right of ownership which the Federal Government may have to any subject invention made under the agreement by a collaborating party or employee of a collaborating party; and*

*"(4) to the extent consistent with any applicable agency requirements and standards of conduct, permit employees or former employees of the laboratory to participate in efforts to commercialize inventions they made while in the service of the United States.*

*"(c) CONTRACT CONSIDERATIONS.—(1) A Federal agency may issue regulations on suitable procedures for implementing the provisions of this section; however, implementation of this section shall not be delayed until issuance of such regulations.*

*"(2) The agency in permitting a Federal laboratory to enter into agreements under this section shall be guided by the purposes of this Act.*

*"(3)(A) Any agency using the authority given it under subsection (a) shall review employee standards of conduct for resolving potential conflicts of interest to make sure they adequately establish guidelines for situations likely to arise through the use of this authority, including but not limited to cases where present or former employees or their partners negotiate licenses or assignments of titles to inventions or negotiate cooperative research and development agreements with federal agencies (including the agency with which the employee involved is or was formerly employed).*

*"(B) If, in implementing subparagraph (A), an agency is unable to resolve potential conflicts of interest within its current statutory framework, it shall propose necessary statutory changes to be forwarded to its authorizing committees in Congress.*

*"(4) The laboratory director in deciding what cooperative research and development agreements to enter into shall—*

*"(A) give special consideration to small business firms, and consortia involving small business firms; and*

*"(B) give preference to business units located in the United States which agree that products embodying inventions made under the cooperative research and development agreement or produced through the use of such inventions will be manufactured substantially in the United States and, in the case of any industrial organization or other person subject to the control of a foreign company or government, as appropriate, take into consideration whether or not such foreign government permits United States agencies, organizations, or other persons to enter into cooperative research and development agreements and licensing agreements.*

*"(5)(A) If the head of the agency or his designee desires an opportunity to disapprove or require the modification of any such agreement, the agreement shall provide a 30-day period within which such action must be taken beginning on the date the agreement is presented to him or her by the head of the laboratory concerned.*

*"(B) In any case in which the head of an agency or his designee disapproves or requires the modification of an agreement presented under this section, the head of the agency or such designee shall transmit a written explanation of such disapproval or modification to the head of the laboratory concerned.*

*"(6) Each agency shall maintain a record of all agreements entered into under this section.*

*"(d) DEFINITION.—As used in this section—*

*"(1) the term 'cooperative research and development agreement' means any agreement between one or more Federal laboratories and one or more non-Federal parties under which the Government, through its laboratories, provides personnel, services, facilities, equipment, or other resources with or without reimbursement (but not funds to non-Federal parties) and the non-Federal parties provide funds, personnel, services, facilities, equipment, or other resources toward the conduct of specified research or development efforts which are consistent with the missions of the laboratory; except that such term does not include a procurement contract or cooperative agreement as those terms are used in sections 6303, 6304, and 6305 of title 31, United States Code; and*

*"(2) the term 'laboratory' means a facility or group of facilities owned, leased, or otherwise used by a Federal agency, a substantial purpose of which is the performance of research, development, or engineering by employees of the Federal Government.*

*"(e) DETERMINATION OF LABORATORY MISSIONS.—For purposes of this section, an agency shall make separate determinations of the mission or missions of each of its laboratories.*

*"(f) RELATIONSHIP TO OTHER LAWS.—Nothing in this section is intended to limit or diminish existing authorities of any agency.*

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*"SEC. ~~13.~~ REWARDS FOR SCIENTIFIC, ENGINEERING, AND TECHNICAL PERSONNEL OF FEDERAL AGENCIES.*

*"The head of each Federal agency that is making expenditures at a rate of more than $50,000,000 per fiscal year for research and development in its Government-operated laboratories shall use the approriate statutory authority to develop and implement a cash awards program to reward its scientific, engineering, and technical personnel for—*

*"(1) inventions, innovations, or other outstanding scientific or technological contributions of value to the United States due to commercial applications or due to contributions to missions of the Federal agency or the Federal Government, or*

*"(2) exemplary activities that promote the domestic transfer of science and technology development within the Federal Government and result in utilization of such science and technology by American industry or business, universities, State or local governments, or other non-Federal parties.*

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*"SEC. ~~14.~~ DISTRIBUTION OF ROYALTIES RECEIVED BY FEDERAL AGENCIES.*

*"(a) IN GENERAL.—(1) Except as provided in paragraphs (2) and (4), any royalties or other income received by a Federal agency from the licensing or assignment of inventions under agreements entered into under section 11 ~~section 12,~~ and inventions of Government-operated Federal laboratories licensed under section 207 of title 35, United States Code, or under any other provision of law, shall be retained by the agency whose laboratory produced the invention and shall be disposed of as follows:*

*"(A)(i) The head of the agency or his designee shall pay at least 15 percent of the royalties or other income the agency receives on account of any invention to the inventor (or co-inventors) if the inventor (or each such co-inventor) was an employee of the agency at the time the invention was made. This clause shall take effect on the date of the enactment of this section unless the agency publishes a notice in the Federal Register within 90 days of such date indicating its election to file a Notice of Proposed Rulemaking pursuant to clause (ii).*

*"(ii) An agency may promulgate, in accordance with section 553 of title 5, United States Code, regulations providing for an alternative program for sharing royalties with inventors who were employed by the agency at the time the invention was made and whose names appear on licensed inventions. Such regulations must—*

*"(I) guarantee a fixed minimum payment to each such inventor, each year that the agency receives royalties from that inventor's invention;*

*"(II) provide a percentage royalty share to each such inventor, each year that the agency receives royalties from that inventor's invention in excess of a threshold amount;*

*"(III) provide that total payments to all such inventors shall exceed 15 percent of total agency royalties in any given fiscal year; and*

*"(IV) provide appropriate incentives from royalties for those laboratory employees who contribute substantially to the technical development of a licensed invention between the time of the filing of the patent application and the licensing of the invention.*

*"(iii) An agency that has published its intention to promulgate regulations under clause (ii) may elect not to pay inventors under clause (i) until the expiration of two years after the date of the enactment of this Act or until the date of the promulgation of such regulations, whichever is earlier. If an agency makes such an election and after two years the regulations have not been promulgated, the agency shall make payments (in accordance with clause (i)) of at least 15 percent of the royalties involved, retroactive to the date of the enactment of this Act. If promulgation of the regulations occurs within two years after the date of the enactment of this Act, payments shall be made in accordance with such regulations, retroactive to the date of the enactment of this Act. The agency shall retain its royalties until the inventor's portion is paid under either clause (i) or (ii). Such royalties shall not be transferred to the agency's Government-operated laboratories under subparagraph (B) and shall not revert to the Treasury pursuant to paragraph (2) as a result of any delay caused by rulemaking under this subparagraph.*

*"(B) The balance of the royalties or other income shall be transferred by the agency to its Government-operated laboratories, with the majority share of the royalties or other income from any invention going to the laboratory where the invention occurred; and the funds so transferred to any such laboratory may be used or obligated by that laboratory during the fiscal year in which they are received or during the succeeding fiscal year—*

*"(i) for payment of expenses incidental to the administration and licensing of inventions by that laboratory or by the agency with respect to inventions which occurred at that laboratory, including the fees or other costs for the services of other agencies, persons, or organizations for invention management and licensing services;*

*"(ii) to reward scientific, engineering, and technical employees of that laboratory;*

*"(iii) to further scientific exchange among the government-operated laboratories of the agency; or*

*"(iv) for education and training of employees consistent with the research and development mission and objectives of the agency, and for other activities that increase the licensing potential for transfer of the technology of the Government-operated laboratories of the agency.*

*Any of such funds not so used or obligated by the end of the fiscal year succeeding the fiscal year in which they are received shall be paid into the Treasury of the United States.*

*"(2) If, after payments to inventors under paragraph (1), the royalties received by an agency in any fiscal year exceed 5 percent of the budget of the Government-operated laboratories of the agency for that year, 75 percent of such excess shall be paid to the Treasury of the United States and the remaining 25 percent may be used or obligated for the purposes described in clauses (i) through (iv) of paragraph (1)(B) during that fiscal year or the succeeding fiscal year. Any funds not so used or obligated shall be paid into the Treasury of the United States.*

*"(3) Any payment made to an employee under this section shall be in addition to the regular pay of the employee and to any other awards made to the employee, and shall not affect the entitlement of the employee to any regular pay, annuity, or award to which he is otherwise entitled or for which he is otherwise eligible or limit the amount thereof. Any payment made to an inventor as such shall continue after the inventor leaves the laboratory or agency. Payments made under this section shall not exceed $100,000 per year to any one person, unless the President approves a larger award (with the excess over $100,000 being treated as a Presidential award under section 4504 of title 5, United States Code).*

*"(4) A Federal agency receiving royalties or other income as a result of invention management services performed for another Federal agency or laboratory under section 207 of title 35, United States Code, shall retain such royalties or income to the extent required to offset the payment of royalties to inventors under clause (i) of paragraph (1)(A), costs and expenses incurred under clause (i) of paragraph (1)(B), and the cost of foreign patenting and maintenance for such invention performed at the request of the other agency or laboratory. All royalties and other income remaining after payment of the royalties, costs, and expenses described in the preceding sentence shall be transferred to the agency for which the services were performed, for distribution in accordance with clauses (i) through (iv) of paragraph (1)(B).*

*"(b) CERTAIN ASSIGMENTS.—If the invention involved was one assigned to the Federal agency—*

*"(1) by a contractor, grantee, or participant in a cooperative agreement with the agency, or*

*"(2) by an employee of the agency who was not working in the laboratory at the time the invention was made.*

*the agency unit that was involved in such assignment shall be considered to be a laboratory for purposes of this section.*

*"(c) REPORTS.—(1) In making their annual budget submissions Federal agencies shall submit, to the appropriate authorization and appropriation committees of both Houses of the Congress, summaries of the amount of royalties or other income received and expenditures made (including inventor awards) under this section.*

*"(2) The Comptroller General, five years after the date of the enactment of this section, shall review the effectiveness of the various royalty-sharing programs established under this section and report to the appropriate committees of the House of Representatives and the Senate, in a timely manner, his findings, conclusions, and recommendations for improvements in such programs.*

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*"SEC. 15. EMPLOYEE ACTIVITIES.*

*"(a) IN GENERAL.—If a Federal agency which has the right of ownership to an invention under this Act does not intend to file for a patent application or otherwise to promote commercialization of such invention, the agency shall allow the inventor, if the inventor is a Government employee or former employee who made the invention during the course of employment with the Government, to retain title to the invention (subject to reservation by the Government of a nonexclusive, nontransferrable, irrevocable, paid-up license to practice the invention or have the invention practiced throughout the world by or on behalf of the Government). In addition, the agency may condition the inventor's right to title on the timely filing of a patent application in cases when the Government determines that it has or may have a need to practice the invention.*

*"(b) DEFINITION.—For purposes of this section, Federal employees include 'special Government employees' as defined in section 202 of title 18, United States Code.*

*"(c) RELATIONSHIP TO OTHER LAWS.—Nothing in this section is intended to limit or diminish existing authorities of any agency.*

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SEC. ~~12.~~ NATIONAL TECHNOLOGY MEDAL.

(a) ESTABLISHMENT.—There is hereby established a National Technology Medal, which shall be of such design and materials and bear such inscriptions as the President, on the basis of recommendations submitted by the Office of Science and Technology Policy, may prescribe.

(b) AWARD.—The President shall periodically award the medal, on the basis of recommendations received from the Secretary or on the basis of such other information and evidence as he deems appropriate, to individuals or companies, which in his judgment are deserving of special recognition by reason of their outstanding contributions to the promotion of technology or technological manpower for the improvement of the economic, environmental, or social well-being of the United States.

(c) PRESENTATION.—The presentation of the award shall be made by the President with such ceremonies as he may deem proper.

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SEC. ~~13.~~ PERSONNEL EXCHANGES.

The Secretary and the National Science Foundation, jointly, shall establish a program to foster the exchange of scientific and technical personnel among academia, industry, and Federal laboratories. Such program shall include both (1) federally supported exchanges and (2) efforts to stimulate exchanges without Federal funding.

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SEC. ~~14.~~ AUTHORIZATION OF APPROPRIATIONS.

(a) There is authorized to be appropriated to the Secretary for purposes of carrying out section 6, not to exceed $19,000,000 for the fiscal year ending September 30, 1981, $40,000,000 for the fiscal year ending September 30, 1982, $50,000,000 for the fiscal year ending September 30, 1983, and $60,000,000 for each of the fiscal years ending September 30, 1984, and 1985.

(b) In addition to authorizations of appropriations under subsection (a), there is authorized to be appropriated to the Secretary for purposes of carrying out the provisions of this Act, not to exceed $5,000,000 for the fiscal year ending September 30, 1981, $9,000,000 for the fiscal year ending September 30, 1982, and $14,000,000 for each of the fiscal years ending September 30, 1983, 1984, and 1985.

(c) Such sums as may be appropriated under subsections (a) and (b) shall remain available until expended.

(d) To enable the National Science Foundation to carry out its powers and duties under this Act only such sums may be appropriated as the Congress may authorize by law.

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SEC. ~~15.~~ SPENDING AUTHORITY.

No payments shall be made or contracts shall be entered into ~~pursuant to this Act~~ *pursuant to the provisions of this Act (other than sections ~~12, 13, and 14~~ 11, 12, and 13)* except to such extent or in such amounts as are provided in advance in appropriation Acts.

on such pesticide, or (II) requests, in accordance with regulations issued by the Administrator, the grant of an experimental use permit for the pesticide under section 5 of the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136c), and ending on the date an application is submitted for registration of such pesticide pursuant to section 3 of such Act (7 U.S.C. 136a); and

"(ii) the period beginning on the date an application is submitted, in accordance with regulations issued by the Administrator, for registration of such pesticide pursuant to section 3 of such Act and ending on the date such pesticide is first registered, either conditionally or fully, under such section.

"(B) With respect to a product that is a chemical substance for which notice is required under section 5 of the Toxic Substances Control Act (15 U.S.C. 2604) or that is a mixture that contains a substance for which such notice is required and—

"(i) that is subject to a rule requiring testing under section 4(a) of such Act (15 U.S.C. 2603), the term means a period commencing on the date the product sponsor has initiated the testing required in such rule and ending on the expiration of the notice period for such chemical substance or mixture under section 5 of such Act, or if an order or injunction is issued under section 5(e) or 5(f) of such Act, the date on which such order or injunction is dissolved or set aside; or

"(ii) that is not subject to a testing rule under section 4 of such Act, the term means a period commencing on the earlier of the date the product sponsor—

"(I) submits, in accordance with regulations issued by the Administrator, a notice under section 5 of such Act, or

"(II) initiates a major health or environmental effects test on such chemical substance or mixture,

and ending on the expiration of the notice period for such substance under section 5 of such Act or if an order or injunction is issued under section 5(e) or 5(f) of such Act, the date on which such order or such injunction is dissolved or set aside.

No regulatory review period shall be deemed to have commenced until a patent has been granted for the product that is subject to regulatory review, for the method for using such product, or for the method for producing such product.

"(d) This section shall cease to be effective after September 30, 1993.".

(b) INFRINGEMENT OF PESTICIDE PATENTS.—Section 271 of title 35, United States Code, is amended by adding at the end thereof the following new subsection:

"(g)(1) During the last 2 years of the term of a patent relating to a pesticide (except for a patent that claims only a method for manufacturing the pesticides) that is or has been registered under the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et seq.), or that is marketed with the permission of the patent holder, it shall not be an act of infringement of the patent—

"(A) to make, use, or sell the pesticide solely for testing reasonably related to the development and submission of data to comply with such Act; or

"(B) to obtain a tolerance, exemption from the need for a tolerance, or food additive regulation under the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.).

"(2) Paragraph (1) shall apply only to the first patent the effect of which was to make an infringement the unlicensed manufacture, use, or sale of the patented product as a pesticide.

"(3) It shall be an act of infringement for any person, other than the patent holder or the licensee of the patent, to submit an application for the registration under the Federal Insecticide, Fungicide, and Rodenticide Act of a pesticide covered by the first patent, as described in paragraph (2), before expiration of such patent.

"(4) For purposes of this paragraph, each formulation of a pesticide containing the identical active ingredient shall be considered the same pesticide.".

(c) TABLE OF CONTENTS.—The analysis for chapter 14 of title 35 of the United States Code is amended by adding at the end thereof the following:

"158. Restoration of patent term for certain agricultural and chemical products.".

# CONFERENCE REPORT ON H.R. 3773

## H-8883

## CONFERENCE REPORT ON H.R. 3773, FEDERAL TECHNOLOGY TRANSFER ACT OF 1986

Mr. FUQUA submitted the following conference report and statement on the bill (H.R. 3773) to amend the Stevenson-Wydler Technology Innovation Act of 1980 to promote technology transfer by authorizing Government-operated laboratories to enter into cooperative research agreements and by establishing a Federal Laboratory Consortium for Technology Transfer within the National Science Foundation, and for other purposes:

CONFERENCE REPORT (H. REPT. 99-953)

The committee of conference on the disagreeing votes of the two Houses on the amendments of the Senate to the bill (H.R. 3773) to amend the Stevenson-Wydler Technology Innovation Act of 1980 to promote technology transfer by authorizing Government-operated laboratories to enter into cooperative research agreements and by establishing a Federal Laboratory Consortium for Technology Transfer within the National Science Foundation, and for other purposes, having met, after full and free conference, have agreed to recommend and do recommend to their respective Houses as follows:

That the House recede from its disagreement to the amendment of the Senate to the text of the bill and agree to the same with an amendment as follows:

In lieu of the matter proposed to be inserted by the Senate amendment insert the following:

*SECTION 1. SHORT TITLE.*

*This Act may be cited as the "Federal Technology Transfer Act of 1986".*

*SEC. 2. COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS.*

*The Stevenson-Wydler Technology Innovation Act of 1980 is amended by redesignating sections 12 through 15 as sections 16 through 19, and by inserting immediately after section 11 the following:*

*"SEC. 12. COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS.*

*"(a) GENERAL AUTHORITY.—Each Federal agency may permit the director of any of its Government-operated Federal laboratories—*

*"(1) to enter into cooperative research and development agreements on behalf of such agency (subject to subsection (c) of this section) with other Federal agencies; units of State or local government; industrial organizations (including corporations, partnerships, and limited partnerships, and industrial development organizations); public and private foundations; nonprofit organizations (including universities); or other persons (including licensees of inventions owned by the Federal agency); and*

*"(2) to negotiate licensing agreements under section 207 of title 35, United States Code, or under other authorities for Government-owned inventions made at the laboratory and other inventions of Federal employees that may be voluntarily assigned to the Government.*

*"(b) ENUMERATED AUTHORITY.—Under agreements entered into pursuant to subsection (a)(1), a Government-operated Federal laboratory may (subject to subsection (c) of this section)—*

*"(1) accept, retain, and use funds, personnel, services, and property from collaborating parties and provide personnel, services, and property to collaborating parties;*

*"(2) grant or agree to grant in advance, to a collaborating party, patent licenses or assignments, or options thereto, in any invention made in whole or in part by a Federal employee under the agreement, retaining a nonexclusive, nontransferrable, irrevocable, paid-up license to practice the invention or have the invention practiced throughout the world by or on behalf of the Government and such other rights as the Federal laboratory deems appropriate; and*

*"(3) waive, subject to reservation by the Government of a nonexclusive, irrevocable, paid-up license to practice the invention or have the invention practiced throughout the world by or on behalf of the Government, in advance, in whole or in part, any right of ownership which the Federal Government may have to any subject invention made under the agreement by a collaborating party or employee of a collaborating party; and*

*"(4) to the extent consistent with any applicable agency requirements and standards of conduct, permit employees or former employees of the laboratory to participate in efforts to commercialize inventions they made while in the service of the United States.*

*"(c) CONTRACT CONSIDERATIONS.—(1) A Federal agency may issue regulations on suitable procedures for implementing the provisions of this section; however, implementation of this section shall not be delayed until issuance of such regulations.*

*"(2) The agency is permitting a Federal laboratory to enter into agreements under this section shall be guided by the purposes of this Act.*

*"(3)(A) Any agency using the authority given it under subsection (a) shall review employee standards of conduct for resolving potential conflicts of interest to make sure they adequately establish guidelines for situ-*

*ations likely to arise through the use of this authority, including but not limited to cases where present or former employees or their partners negotiate licenses or assignments of titles to inventions or negotiate cooperative research and development agreements with federal agencies (including the agency with which the employee involved is or was formerly employed).*

*"(B) If, in implementing subparagraph (A), an agency is unable to resolve potential conflicts of interest within its current statutory framework, it shall propose necessary statutory changes to be forwarded to its authorizing committees in Congress.*

*"(4) The laboratory director in deciding what cooperative research and development agreements to enter into shall—*

*"(A) give special consideration to small business firms, and consortia involving small business firms; and*

*"(B) give preference to business units located in the United States which agree that products embodying inventions made under the cooperative research and development agreement or produced through the use of such inventions will be manufactured substantially in the United States and, in the case of any industrial organization or other person subject to the control of a foreign company or government, as appropriate, take into consideration whether or not such foreign government permits United States agencies, organizations, or other persons to enter into cooperative research and development agreements and licensing agreements.*

*"(5)(A) If the head of the agency or his designee desires an opportunity to disapprove or require the modification of any such agreement, the agreement shall provide a 30-day period within which such action must be taken beginning on the date the agreement is presented to him or her by the head of the laboratory concerned.*

*"(B) In any case in which the head of an agency or his designee disapproves or requires the modification of an agreement presented under this section, the head of the agency or such designee shall transmit a written explanation of such disapproval or modification to the head of the laboratory concerned.*

*"(6) Each agency shall maintain a record of all agreements entered into under this section.*

*"(d) DEFINITION.—As used in this section—*

*"(1) the term 'cooperative research and development agreement' means any agreement between one or more Federal laboratories and one or more non-Federal parties under which the Government, through its laboratories, provides personnel, services, facilities, equipment, or other resources with or without reimbursement (but not funds to non-Federal parties) and the non-Federal parties provide funds, personnel, services, facilities, equipment, or other resources toward the conduct of specified research or development efforts which are consistent with the missions of the laboratory; except that such term does not include a procurement contract or cooperative agreement as those terms are used in sections 6303, 6304, and 6305 of title 31, United States Code; and*

*"(2) the term 'laboratory' means a facility or group of facilities owned, leased, or otherwise used by a Federal agency, a substantial purpose of which is the performance of research, development, or engineering by employees of the Federal Government.*

*"(e) DETERMINATION OF LABORATORY MISSIONS.—For purposes of this section, an agency shall make separate determinations of the mission or missions of each of its laboratories.*

*"(f) RELATIONSHIP TO OTHER LAWS.—Nothing in this section is intended to limit or diminish existing authorities of any agency.".*

*SEC. 3. ESTABLISHMENT OF FEDERAL LABORATORY CONSORTIUM FOR TECHNOLOGY TRANSFER.*

*Section 11 of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3710) is amended—*

*(1) by redesignating subsection (e) as subsection (f); and*

*(2) by inserting after subsection (d) the following:*

*"(e) ESTABLISHMENT OF FEDERAL LABORATORY CONSORTIUM FOR TECHNOLOGY TRANSFER.—(1) There is hereby established the Federal Laboratory Consortium for Technology Transfer (hereinafter referred to as the 'Consortium') which, in cooperation with Federal laboratories and the private sector, shall—*

*"(A) develop and (with the consent of the Federal laboratory concerned) administer techniques, training courses, and materials concerning technology transfer to increase the awareness of Federal laboratory employees regarding the commercial potential of laboratory technology and innovations;*

*"(B) furnish advice and assistance requested by Federal agencies and laboratories for use in their technology transfer programs (including the planning of seminars for small business and other industry);*

*"(C) provide a clearinghouse for requests, received at the laboratory level, for technical assistance from States and units of local*



*governments, businesses, industrial development organizations, not-for-profit organizations including universities, Federal agencies and laboratories, and other persons, and—*

*"(i) to the extent that such requests can be responded to with published information available to the National Technical Information Service, refer such requests to that Service, and*

*"(ii) otherwise refer these requests to the appropriate Federal laboratories and agencies;*

*"(D) facilitate communication and coordination between Offices of Research and Technology Applications of Federal laboratories;*

*"(E) utilize (with the consent of the agency involved) the expertise and services of the National Science Foundation, the Department of Commerce, the National Aeronautics and Space Administration, and other Federal agencies, as necessary;*

*"(F) with the consent of any Federal laboratory, facilitate the use by such laboratory of appropriate technology transfer mechanisms such as personnel exchanges and computer-based systems;*

*"(G) with the consent of any Federal laboratory, assist such laboratory to establish programs using technical volunteers to provide technical assistance to communities related to such laboratory;*

*"(H) facilitate communication and cooperation between Offices of Research and Technology Applications of Federal laboratories and regional, State, and local technology transfer organizations;*

*"(I) when requested, assist colleges or universities, businesses, nonprofit organizations, State or local governments, or regional organizations to establish programs to stimulate research and to encourage technology transfer in such areas as technology program development, curriculum design, long-term research planning, personnel needs projections, and productivity assessments; and*

*"(J) seek advice in each Federal laboratory consortium region from representatives of State and local governments, large and small business, universities, and other appropriate persons on the effectiveness of the program (and any such advice shall be provided at no expense to the Government).*

*"(2) The membership of the Consortium shall consist of the Federal laboratories described in clause (1) of subsection (b) and such other laboratories as may choose to join the Consortium. The representatives to the Consortium shall include a senior staff member of each Federal laboratory which is a member of the Consortium and a representative appointed from each Federal agency with one or more member laboratories.*

*"(3) The representatives to the Consortium shall elect a Chairman of the Consortium.*

*"(4) The Director of the National Bureau of Standards shall provide the Consortium, on a reimbursable basis, with administrative services, such as office space, personnel, and support services of the Bureau, as requested by the Consortium and approved by such Director.*

*"(5) Each Federal laboratory or agency shall transfer technology directly to users or representatives of users, and shall not transfer technology directly to the Consortium. Each Federal laboratory shall conduct and transfer technology only in accordance with the practices and policies of the Federal agency which owns, leases, or otherwise uses such Federal laboratory.*

*"(6) Not later than one year after the date of the enactment of this subsection, and every year thereafter, the Chairman of the Consortium shall submit a report to the President, to the appropriate authorization and appropriation committees of both Houses of the Congress, and to each agency with respect to which a transfer of funding is made (for the fiscal year or years involved) under paragraph (7), concerning the activities of the Consortium and the expenditures made by it under this subsection during the year for which the report is made.*

*"(7)(A) Subject to subparagraph (B), and amount equal to 0.005 percent of that portion of the research and development budget of each Federal agency that is to be utilized by the laboratories of such agency for a fiscal year referred to in subparagraph (B)(ii) shall be transferred by such agency to the National Bureau of Standards at the beginning of the fiscal year involved. Amounts so transferred shall be provided by the Bureau to the Consortium for the purpose of carrying out activities of the Consortium under this subsection.*

*"(B) A transfer shall be made by any Federal agency under subparagraph (A), for any fiscal year, only if—*

*"(i) the amount so transferred by that agency (as determined under such subparagraph) would exceed $10,000; and*

*"(ii) such transfer is made with respect to the fiscal year 1987, 1988, 1989, 1990, or 1991.*

*"(C) The heads of Federal agencies and their designees, and the directors of Federal laboratories, may provide such additional support for operations of the Consortium as they deem appropriate.*

*"(8) (A) The Consortium shall use 5 percent of the funds provided in paragraph (7)(A) to establish demonstration projects in technology transfer. To carry out such projects, the Consortium may arrange for grants or awards to, or enter into agreements with, nonprofit State, local, or private organizations or entities whose pri-*

*mary purposes are to facilitate cooperative research between the Federal laboratories and organizations not associated with the Federal laboratories, to transfer technology from the Federal laboratories, and to advance State and local economic activity.*

*"(B) The demonstration projects established under subparagraph (A) shall serve as model programs. Such projects shall be designed to develop programs and mechanisms for technology transfer from the Federal laboratories which may be utilized by the States and which will enhance Federal, State and local programs for the transfer of technology.*

*"(C) Application for such grants, awards, or agreements shall be in such form and contain such information as the Consortium or its designee shall specify.*

*"(D) Any person who receives or utilizes any proceeds of a grant or award made, or agreement entered into, under this paragraph shall keep such records as the Consortium or its designee shall determine are necessary and appropriate to facilitate effective audit and evaluation, including records which fully disclose the amount and disposition of such proceeds and the total cost of the project in connection with which such proceeds were used.".*

*SEC. 4. UTILIZATION OF FEDERAL TECHNOLOGY.*

*"(a) RESPONSIBILITY FOR TECHNOLOGY TRANSFER.—Section 11(a) of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3710(a)) is amended—*

*"(1) by inserting "(1)" after "POLICY.—"; and*

*"(2) by adding at the end thereof the following new paragraphs:*

*"(2) Technology transfer, consistent with mission responsibilities, is a responsibility of each laboratory science and engineering professional.*

*"(3) Each laboratory director shall ensure that efforts to transfer technology are considered positively in laboratory job descriptions, employee promotion policies, and evaluation of the job performance of scientists and engineers in the laboratory.".*

*(b) RESEARCH AND TECHNOLOGY APPLICATIONS OFFICES.—(1) Section 11(b) of such Act (15 U.S.C. 3710(b)) is amended—*

*(A) by striking out "a total annual budget exceeding $20,000,000 shall provide at least one professional individual full-time" and inserting in lieu thereof "200 or more full-time equivalent scientific, engineering, and related technical positions shall provide one or more full-time equivalent positions";*

*(B) by inserting immediately before the next to last sentence the following new sentence: "Furthermore, individuals filling positions in an Office of Research and Technology Applications shall be included in the overall laboratory/agency management development program so as to ensure that highly competent technical managers are full participants in the technology transfer process.";*

*(C) by striking out "requirements set forth in (1) and/or (2) of this subsection" in the next to last sentence and inserting in lieu thereof "requirement set forth in clause (2) of the preceding sentence"; and*

*(D) by striking out "either requirement (1) or (2)" in the last sentence and inserting in lieu thereof "such requirement".*

*(2) Section 11(c) of such Act (15 U.S.C. 3710(c)) is amended—*

*(A) by striking out paragraph (1) and inserting in lieu thereof the following:*

*"(1) to prepare application assessments for selected research and development projects in which that laboratory is engaged and which in the opinion of the laboratory may have potential commercial applications;";*

*(B) by striking out "the Center for the Utilization of Federal Technology" in paragraph (3) and inserting in lieu thereof "the National Technical Information Service, the Federal Laboratory Consortium for Technology Transfer,", and by striking out "and" after the semicolon;*

*(C) by striking out "in response to requests from State and local government officials." in paragraph (4) and inserting in lieu thereof "to State and local government officials; and"; and*

*(D) by inserting immediately after paragraph (4) the following new paragraph:*

*"(5) to participate, where feasible, in regional, State, and local programs designed to facilitate or stimulate the transfer of technology for the benefit of the region, State, or local jurisdiction in which the Federal laboratory is located."*

*(c) DISSEMINATION OF TECHNICAL INFORMATION.—Section 11(d) of such Act (15 U.S.C. 3710(d)) is amended—*

*(1) by striking out "(d)" and all that follows down through "shall—" and inserting in lieu thereof the following:*

*(d) DISSEMINATION OF TECHNICAL INFORMATION.—The National Technical Information Service shall—";*

*(2) by striking out paragraph (2);*

*(3) by striking out "existing" in paragraph (3), and redesignating such paragraph as paragraph (2);*

*(4) by striking out paragraph (4) and inserting in lieu thereof the following:*

*"(3) receive requests for technical assistance from State and local governments, respond to such requests with published information available to the Service, and refer such requests to the Federal Laboratory Consortium for Technology Transfer to the extent that such requests require a response*

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*involving more than the published information available to the Service;";*

*(5) by redesignating paragraphs (5) and (6) as paragraphs (4) and (5), respectively; and*

*(6) by striking out "(c)(4)" in paragraph (4) as so redesignated and inserting in lieu thereof "(c)(3)".*

*(d) AGENCY REPORTING.—Section 11(f) of such Act (15 U.S.C. 3710(e)) (as redesignated by section 3(1) of this Act) is amended—*

*(1) by striking out "prepare biennially a report summarizing the activities" in the first sentence and inserting in lieu thereof "report annually to the Congress, as part of the agency's annual budget submission, on the activities"; and*

*(2) by striking out the second sentence.*

*SEC. 5. FUNCTIONS OF THE SECRETARY OF COMMERCE.*

*Section 11 of the Stevenson-Wydler Technology Innovation Act of 1980 (as amended by the preceding provisions of this Act) is further amended by adding at the end thereof the following new subsection:*

*"(g) FUNCTIONS OF THE SECRETARY.—(1) The Secretary, in consultation with other Federal agencies, may—*

*"(A) make available to interested agencies the expertise of the Department of Commerce regarding the commercial potential of inventions and methods and options for commercialization which are available to the Federal laboratories, including research and development limited partnerships;*

*"(B) develop and disseminate to appropriate agency and laboratory personnel model provisions for use on a voluntary basis in cooperative research and development arrangements; and*

*"(C) furnish advice and assistance, upon request, to Federal agencies concerning their cooperative research and development programs and projects.*

*"(2) Two years after the date of the enactment of this subsection and every two years thereafter, the Secretary shall submit a summary report to the President and the Congress on the use by the agencies and the Secretary of the authorities specified in this Act. Other Federal agencies shall cooperate in the report's preparation.*

*"(3) Not later than one year after the date of the enactment of the Federal Technology Transfer Act of 1986, the Secretary shall submit to the President and the Congress a report regarding—*

*"(A) any copyright provisions or other types of barriers which tend to restrict or limit the transfer of federally funded computer software to the private sector and to State and local governments, and agencies of such State and local governments; and*

*"(B) the feasibility and cost of compiling and maintaining a current and comprehensive inventory of all federally funded training software.".*

*SEC. 6. REWARDS FOR SCIENTIFIC, ENGINEERING, AND TECHNICAL PERSONNEL OF FEDERAL AGENCIES.*

*The Stevenson-Wydler Technology Innovations Act of 1980 (as amended by the preceding provisions of this Act) is further amended by inserting after section 12 the following new section:*

*"SEC. 13. REWARDS FOR SCIENTIFIC, ENGINEERING, AND TECHNICAL PERSONNEL OF FEDERAL AGENCIES.*

*"The head of each Federal agency that is making expenditures at a rate of more than $50,000,000 per fiscal year for research and development in its Government-operated laboratories shall use the approriate statutory authority to develop and implement a cash awards program to reward its scientific, engineering, and technical personnel for—*

*"(1) inventions, innovations, or other outstanding scientific or technological contributions of value to the United States due to commercial applications or due to contributions to missions of the Federal agency or the Federal Government, or*

*"(2) exemplary activities that promote the domestic transfer of science and technology development within the Federal Government and result in utilization of such science and technology by American industry or business, universities, State or local governments, or other non-Federal parties.".*

*SEC. 7. DISTRIBUTION OF ROYALTIES RECEIVED BY FEDERAL AGENCIES.*

*The Stevenson-Wydler Technology Innovation Act of 1980 (as amended by the preceding provisons of this Act) is further amended by inserting after section 13 the following new section:*

*"SEC. 14. DISTRIBUTION OF ROYALTIES RECEIVED BY FEDERAL AGENCIES.*

*"(a) IN GENERAL.—(1) Except as provided in paragraphs (2) and (4), any royalties or other income received by a Federal agency from the licensing or assignment of inventions under agreements entered into under section 12, and inventions of Government-operated Federal laboratories licensed under section 207 of title 35, United States Code, or under any other provision of law, shall be retained by the agency whose laboratory produced the invention and shall be disposed of as follows:*

*"(A)(i) The head of the agency or his designee shall pay at least 15 percent of the royalties or other income the agency receives on account of any invention to the inventor (or co-inventors) if the inventor (or each such*

co-inventor) was an employee of the agency at the time the invention was made. This clause shall take effect on the date of the enactment of this section unless the agency publishes a notice in the Federal Register within 90 days of such date indicating its election to file a Notice of Proposed Rulemaking pursuant to clause (ii).

"(ii) An agency may promulgate, in accordance with section 553 of title 5, United States Code, regulations providing for an alternative program for sharing royalties with inventors who were employed by the agency at the time the invention was made and whose names appear on licensed inventions. Such regulations must—

"(I) guarantee a fixed minimum payment to each such inventor, each year that the agency receives royalties from that inventor's invention;

"(II) provide a percentage royalty share to each such inventor, each year that the agency receives royalties from that inventor's invention in excess of a threshold amount;

"(III) provide that total payments to all such inventors shall exceed 15 percent of total agency royalties in any given fiscal year; and

"(IV) provide appropriate incentives from royalties for those laboratory employees who contribute substantially to the technical development of a licensed invention between the time of the filing of the patent application and the licensing of the invention.

"(iii) An agency that has published its intention to promulgate regulations under clause (ii) may elect not to pay inventors under clause (i) until the expiration of two years after the date of the enactment of this Act or until the date of the promulgation of such regulations, whichever is earlier. If an agency makes such an election and after two years the regulations have not been promulgated, the agency shall make payments (in accordance with clause (i)) of at least 15 percent of the royalties involved, retroactive to the date of the enactment of this Act. If promulgation of the regulations occurs within two years after the date of the enactment of this Act, payments shall be made in accordance with such regulations, retroactive to the date of the enactment of this Act. The agency shall retain its royalties until the inventor's portion is paid under either clause (i) or (ii). Such royalties shall not be transferred to the agency's Government-operated laboratories under subparagraph (B) and shall not revert to the Treasury pursuant to paragraph (2) as a result of any delay caused by rulemaking under this subparagraph.

"(B) The balance of the royalties or other income shall be transferred by the agency to its Government-operated laboratories, with the majority share of the royalties or other income from any invention going to the laboratory where the invention occurred; and the funds so transferred to any such laboratory may be used or obligated by that laboratory during the fiscal year in which they are received or during the succeeding fiscal year—

"(i) for payment of expenses incidental to the administration and licensing of inventions by that laboratory or by the agency with respect to inventions which occurred at that laboratory, including the fees or other costs for the services of other agencies, persons, or organizations for invention management and licensing services;

"(ii) to reward scientific, engineering, and technical employees of that laboratory;

"(iii) to further scientific exchange among the government-operated laboratories of the agency; or

"(iv) for education and training of employees consistent with the research and development mission and objectives of the agency, and for other activities that increase the licensing potential for transfer of the technology of the Government-operated laboratories of the agency.

Any of such funds not so used or obligated by the end of the fiscal year succeeding the fiscal year in which they are received shall be paid into the Treasury of the United States.

"(2) If, after payments to inventors under paragraph (1), the royalties received by an agency in any fiscal year exceed 5 percent of the budget of the Government-operated laboratories of the agency for that year, 75 percent of such excess shall be paid to the Treasury of the United States and the remaining 25 percent may be used or obligated for the purposes described in clauses (i) through (iv) of paragraph (1)(B) during that fiscal year or the succeeding fiscal year. Any funds not so used or obligated shall be paid into the Treasury of the United States.

"(3) Any payment made to an employee under this section shall be in addition to the regular pay of the employee and to any other awards made to the employee, and shall not affect the entitlement of the employee to any regular pay, annuity, or award to which he is otherwise entitled or for which he is otherwise eligible or limit the amount thereof. Any payment made to an inventor as such shall continue after the inventor leaves the laboratory or agency. Payments made under this section shall not exceed $100,000 per year to any one person, unless the President approves a larger award (with the excess over $100,000 being treated as a Presidential award under section 4504 of title 5, United States Code).

"(4) A Federal agency receiving royalties or other income as a result of invention management services performed for another Federal agency or laboratory under section 207 of title 35, United States Code, shall retain such royalties or income to the extent required to offset the payment of royalties to



inventors under clause (i) of paragraph (1)(A), costs and expenses incurred under clause (i) of paragraph (1)(B), and the cost of foreign patenting and maintenance for such invention performed at the request of the other agency or laboratory. All royalties and other income remaining after payment of the royalties, costs, and expenses described in the preceding sentence shall be transferred to the agency for which the services were performed, for distribution in accordance with clauses (i) through (iv) of paragraph (1)(B).

"(b) CERTAIN ASSIGNMENTS.—If the invention involved was one assigned to the Federal agency—

"(1) by a contractor, grantee, or participant in a cooperative agreement with the agency, or

"(2) by an employee of the agency who was not working in the laboratory at the time the invention was made,

the agency unit that was involved in such assignment shall be considered to be a laboratory for purposes of this section.

"(c) REPORTS.—(1) In making their annual budget submissions Federal agencies shall submit, to the appropriate authorization and appropriation committees of both Houses of the Congress, summaries of the amount of royalties or other income received and expenditures made (including inventor awards) under this section.

"(2) The Comptroller General, five years after the date of the enactment of this section, shall review the effectiveness of the various royalty-sharing programs established under this section and report to the appropriate committees of the House of Representatives and the Senate, in a timely manner, his findings, conclusions, and recommendations for improvements in such programs.".

SEC. 8. EMPLOYEE ACTIVITIES.

The Stevenson-Wydler Technology Innovation Act of 1980 (as amended by the preceding provisions of this Act) is further amended by inserting after section 14 the following new section:

"SEC. 15. EMPLOYEE ACTIVITIES.

"(a) IN GENERAL.—If a Federal agency which has the right of ownership to an invention under this Act does not intend to file for a patent application or otherwise to promote commercialization of such invention, the agency shall allow the inventor, if the inventor is a Government employee or former employee who made the invention during the course of employment with the Government, to retain title to the invention (subject to reservation by the Government of a nonexclusive, nontransferrable, irrevocable, paid-up license to practice the invention or have the invention practiced throughout the world by or on behalf of the Government). In addition, the agency may condition the inventor's right to title on the timely filing of a patent application in cases when the Government determines that it has or may have a need to practice the invention.

"(b) DEFINITION.—For purposes of this section, Federal employees include 'special Government employees' as defined in section 202 of title 18, United States Code.

"(c) RELATIONSHIP TO OTHER LAWS.—Nothing in this section is intended to limit or diminish existing authorities of any agency.".

SEC. 9. MISCELLANEOUS AND CONFORMING AMENDMENTS.

(a) REPEAL OF NATIONAL INDUSTRIAL TECHNOLOGY BOARD.—Section 10 of the Stevenson-Wydler Technology Innovation Act of 1980 (15 U.S.C. 3709) is repealed.

(b) CHANGES IN TERMINOLOGY OR ADMINISTRATIVE STRUCTURE.—(1) Section 3(2) of the Stevenson-Wydler Technology Innovation Act of 1980 is amended by striking out "centers for industrial technology" and inserting in lieu thereof "cooperative research centers".

(2) Section 4 of such Act is amended—

(A) by striking out "Industrial Technology" in paragraph (1) and inserting in lieu thereof "Productivity, Technology, and Innovation";

(B) by striking out "'Director' means the Director of the Office of Industrial Technology" in paragraph (3) and inserting in lieu thereof "'Assistant Secretary' means the Assistant Secretary for Productivity, Technology, and Innovation";

(C) by striking out "Centers for Industrial Technology" in paragraph (4) and inserting in lieu thereof "Cooperative Research Centers";

(D) by striking out paragraph (6), and redesignating paragraphs (7) and (8) as paragraphs (6) and (7), respectively; and

(E) by striking out "owned and funded" in paragraph (6) as so redesignated and inserting in lieu thereof "owned, leased, or otherwise used by a Federal agency and funded".

(3) Section 5(a) of such Act is amended by striking out "Industrial Technology" and inserting in lieu thereof "Productivity, Tedchnology, and Innovation".

(4) Section 5(b) of such Act is amended by striking out "DIRECTOR" and inserting in lieu thereof "ASSISTANT SECRETARY", and by striking out "a Director of the Office" and

*all that follows and inserting in lieu thereof "an Assistant Secretary for Productivity, Technology, and Innovation.".*

*(5) Section 5(c) of such Act is amended—*

*(A) by striking out "the Director" each place it appears and inserting in lieu thereof "the Assistant Secretary";*

*(B) by redesignating paragraphs (7) and (8) as paragraphs (9) and (10), respectively; and*

*(C) by inserting immediately after paragraph (6) the following new paragraphs:*

*"(7) encourage and assist the creation of centers and other joint initiatives by State of local governments, regional organizations, private businesses, institutions of higher education, nonprofit organizations, or Federal laboratories to encourage technology transfer, to stimulate innovation, and to promote an appropriate climate for investment in technology-related industries;*

*"(8) propose and encourage cooperative research involving appropriate Federal entities, State or local governments, regional organizations, colleges or universities, nonprofit organizations, or private industry to promote the common use of resources, to improve training programs and curricula, to stimulate interest in high technology careers, and to encourage the effective dissemination of technology skills within the wider community;".*

*(6) The heading of section 6 of such Act is amended to read as follows:*

*"SEC. 6. COOPERATIVE RESEARCH CENTERS."*

*(7) Section 6(a) of such Act is amended by striking out "Centers for Industrial Technology" and inserting in lieu thereof "Cooperative Research Centers".*

*(8) Section 6(b)(1) of such Act is amended by striking out "basic and applied".*

*(9) Section 6(e) of such Act is amended to read as follows:*

*"(e) RESEARCH AND DEVELOPMENT UTILIZATION.—In the promotion of technology from research and development efforts by Centers under this section, chapter 18 of title 35, United States Code, shall apply to the extent not inconsistent with this section.".*

*(10) Section 6(f) of such Act is repealed.*

*(11) The heading of section 8 of such Act is amended by striking out "CENTERS FOR INDUSTRIAL TECHNOLOGY" and inserting in lieu thereof "COOPERATIVE RESEARCH CENTERS".*

*(12) Section 8(a) of such Act is amended by striking out "Centers for Industrial Technology" and inserting in lieu thereof "Cooperative Research Centers".*

*(13) Section 19 of such Act (as redesignated by section 2 of this Act) is amended by striking out "pursuant to this Act" and inserting in lieu thereof "pursuant to the provisions of this Act (other than sections 12, 13, and 14)".*

*(c) RELATED CONFORMING AMENDMENT.—Section 210 of title 35, United States Code, is amended by adding at the end thereof the following new subsection:*

*"(e) The provisions of the Stevenson-Wydler Technology Innovation Act of 1980, as amended by the Federal Technology Transfer Act of 1986, shall take precedence over the provisions of this chapter to the extent that they permit or require a disposition of rights in subject inventions which is inconsistent with this chapter.".*

*(d) ADDITIONAL DEFINITIONS.—Section 4 of such Act (as amended by subsection (b)(2) of this section) is further amended by adding at the end thereof the following new paragraphs:*

*"(8) 'Federal agency' means any executive agency as defined in section 105 of title 5, United States Code, and the military departments as defined in section 102 of such title.*

*"(9) 'Invention' means any invention or discovery which is or may be patentable or otherwise protected under title 35, United States Code, or any novel variety of plant which is or may be protectable under the Plant Variety Protection Act (7 U.S.C. 2321 et seq.).*

*"(10) 'Made' when used in conjunction with any invention means the conception or first actual reduction to practice of such invention.*

*"(11) 'Small business firm' means a small business concern as defined in section 2 of Public Law 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration.*

*"(12) 'Training technology' means computer software and related materials which are developed by a Federal agency to train employees of such agency, including but not limited to software for computer-based instructional systems and for interactive video disc systems.".*

*(e) REDESIGNATION OF SECTIONS TO REFLECT CHANGES MADE BY PRECEDING PROVISIONS.—(1) Such Act (as amended by the preceding provisions of this Act) is further amended by redesignating sections 11 through 19 as sections 10 through 18, respectively.*

*(2)(A) Section 5(d) of such Act is amended by inserting "(as then in effect)" after "sections 5, 6, 8, 11, 12, and 13 of this Act."*

*(B) Section 8(a) of such Act is amended by striking out the last sentence.*

*(C) Section 9(d) of such Act is amended by striking out "or 13" and inserting in lieu thereof "10, 14, or 16."*

*(3) Section 13((a)(1) of such Act (as redesignated by paragraph (1) of this subsection) is amended by striking out "section 12" in the matter preceding subparagraph (A) and inserting in lieu thereof "section 11."*

*(4) Section 18 of such Act (as redesignated by paragraph (1) of this subsection) is amended by striking out "sections 12, 13, and 14" and inserting in lieu thereof "sections 11, 12, and 13."*

*(f) CLARIFICATION OF FINDINGS AND PURPOSES.—(1) The second sentence of section 2(10) of such Act (15 U.S.C. 3701(10)) is amended by inserting ", which include inventions, computer software, and training technologies," immediately after "developments."*

*(2) Section 3(3) of such Act (15 U.S.C. 3702(3)) is amended by inserting ", including inventions, software, and training technologies," immediately after "developments."*



And the Senate agree to the same.

That the House recede from its disagreement to the amendment of the Senate to the title of the bill and agree to the same.

DON FUQUA,
DOUG WALGREN,
STAN LUNDINE,
MANUEL LUJAN, JR.,
SHERWOOD L. BOEHLERT,
*Managers on the Part of the House.*
JACK DANFORTH,
FRITZ HOLLINGS,
DON RIEGLE,
SLADE GORTON,
LARRY PRESSLER,
*Managers on the Part of the Senate.*

## JOINT EXPLANATORY STATEMENT OF THE COMMITTEE OF CONFERENCE

The managers on the part of the House and the Senate at the conference on the disagreeing votes of the two Houses on the amendments of the Senate to the bill (H.R. 3773) to amend the Stevenson-Wydler Technology Innovation Act of 1980 to promote technology transfer by authorizing Government-operated laboratories to enter into cooperative research agreements and by establishing a Federal Laboratory Consortium for Technology Transfer within the National Science Foundation, and for other purposes, submit the following joint statement to the House and the Senate in explanation of the effect of the action agreed upon by the managers and recommended in the accompanying conference report:

The Senate amendment to the text of the bill struck out all of the House bill after the enacting clause and inserted a substitute text.

The House recedes from its disagreement to the amendment of the Senate with an amendment which is a substitute for the House bill and the Senate amendment. The differences between the House bill, the Senate amendment, and the substitute agreed to in conference are noted below, except for clerical corrections, conforming changes made necessary by agreements reached by the conferees, and minor drafting and clarifying changes.

The following section-by-section analysis explains actions for the managers in the conference report to accompany H.R. 3773.

### SECTION 1.—SHORT TITLE

The Conferees chose to use the Senate version of the title: "Federal Technology Transfer Act of 1986."

### SECTION 2.—COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS

There were marked similarities between the House and Senate-passed versions of this section. Both reflected the concern that the Federal laboratories need clear authority to do cooperative research and that they need to be able to exercise that authority at the laboratory level. Both permit the laboratories to enter into cooperative research and development agreements with a wide range of parties. Both strive to make the entering of these agreements as easy as possible from the point of view of the private sector participant, while protecting the legitimate concerns of the government. This authority is optional in both versions and is not intended to affect previously existing cooperative agreement authority, such as the Space Act provisions, which for almost three decades have permitted NASA laboratories to enter into cooperative agreements.

The conferees deleted the House version's requirement of an agency plan within 180 days of enactment of the section. Instead of requiring a plan or regulations, the conference version of the legislation makes regulations optional and makes it clear that implementation of the cooperative research and development authority can begin in advance of any regulations.

The conferees adopted many of the modifications the Senate made to the House-passed version of this section. The conference version specifically states that a laboratory may accept funds, personnel, and services, and collaborating parties may accept the same, with the exception of funds, as their contribution under a cooperative agreement. It applies to any inventions occurring under a cooperative R&D agreement, the long-standing tradition of reserving the right in the government to a paid-up non-exclusive license in that invention. It also clearly gives permission to present and former federal employees of a laboratory to be a party to efforts to commercialize that laboratory's inventions, to the extent they can do so and not be in violation of agency requirements and standards of conduct.

The conditions on the exercise of the cooperative agreement authority which were

part of the Agency Plan under the House version of the legislation are still to be considered by the laboratories in deciding with whom to contract. Special consideration is still to be given to small businesses and consortia involving small business. The purpose of this requirement is to ensure access by these groups to the laboratories and is not intended to limit access by non-profit organizations and universities.

The provisions from both versions dealing with the preference to U.S. business units were accepted. Therefore, laboratories are to give preference to business units located in the United States which agree to domestic manufacture. When evaluating whether to grant access by a foreign company, the Federal laboratories may examine the willingness of the foreign government to open its own laboratories to U.S. firms.

The House-passed provisions on conflict on interest are retained as is, and its provisions for review of a cooperative research and development agreement and for limited headquarters review of agreements are accepted substantially as passed by that body.

SECTION 3.—ESTABLISHMENT OF FEDERAL CONSORTIUM FOR TECHNOLOGY TRANSFER

The conferees recommend adopting the Senate decisions to affiliate the Federal Laboratory Consortium with the National Bureau of Standards to establish a program for demonstration projects in technology transfer. They further recommend funding the consortium at House-recommended levels.

Both the House and the Senate-passed vesions of this legislation address the need of the Federal Laboratory Consortium (FLC) to have a permanent connection with a federal agency and a more predictable source of funding for the next five years. These two changes will permit the FLC, which has operated with very limited funding for much of its 15 years, to coordinate its program better and to expand its efforts at permitting the technology transfer officers of the various Federal laboratories to work more closely together. It is the clear intent of both Houses that, to the extent possible, the existing programs and initiatives of the FLC be continued uninterrupted as the organizational changes required by the Act are made. As soon as practical after enactment, the current FLC officers are asked to begin the FLC's transition by convening a meeting both of the current FLC representatives and of representatives of any laboratories added to the Consortium by this Act. Because of the twin goals of continuity and increased effectiveness for the FLC, these efforts should not await funds transfers under the FLC set-aside provision.

The Federal Laboratory Consortium is expected to remain a networking organization of the Federal laboratories and their technology transfer officers. The consortium is to function as a clearinghouse of information and has purposely been established with a small budget and small paid staff so that the volunteer spirit that has made the organization a success to date will continue. The consortium is not to engage directly in the transfer of technology. Rather, it is expected to help the laboratories that develop the technology to do a better job of transferring it by themselves or through appropriate agents.

The conferees felt, however, for the FLC to perform this function properly, increased funding is necessary for such projects as expanding the Consortium's electronic mail system and strengthening its regional operations. These efforts, plus the planned re-establishment at the National Bureau of Standards of a small Washington presence, led the conferees to recommend that the FLC set-aside be the House-passed figure of .005% to fund the operations of the organization. Five percent of these funds would be used to cover the Senate-passed program of demonstration projects in technology transfer. The Conferees see these demonstrations as a useful complement to the Federal Laboratory Consortium. At least two such demonstrations are to be funded over the five year life of the demonstration program, and the Consortium should look for diversity both in the types of demonstrations funded and in the states hosting the demonstrations. The Federal Laboratory Consortium is expected to develop program specifications, but the conferees expect the actual competition and awards process to be conducted at the request of the FLC either by a federal agency or by a laboratory with existing capabilities to administer such a program.

The conferees recommend establishment of the House-passed concept of regional advisors for the Federal Laboratory Consortium but did not choose to establish formal advisory committees. These volunteers will provide insights from the business community which will help the consortium stay on target in its efforts to make the laboratories helpful and accessible to the business community. The conferees also recommend inclusion of the Senate provision authorizing the Consortium to encourage laboratories, when requested, to assist interested organizations and businesses in various facets of technology program planning and curriculum design.

SECTION 4.—UTILIZATION OF FEDERAL TECHNOLOGY

The House and Senape-passed versions of this section, designed to upgrade the status of laboratory professionals who do technology transfer, were similar. The conferees recommend accepting from the House version, the policy statement that technology transfer is a responsibility of every laboratory's scientific and engineering professional, and the requirement that technology transfer professionals be included in overall laboratory/agency management development programs. From the Senate version, the conferees recommend inclusion among the functions of technology transfer professionals, participation, where feasible, in state, local and regional technology transfer efforts. The House requirements of technology transfer reports as part of agency annual budget submissions is retained.

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SECTION 6.—FUNCTIONS OF THE SECRETARY

The conferees recommend acceptance of the Senate's two additions to the bill's lists of duties of the Secretary of Commerce. The Secretary is required to submit biennial reports to the President and the Congress on the use by agencies of Stevenson-Wydler Act authorities. The original Stevenson-Wydler Act required one such report. The Secretary also is required to submit a one-time report to the President and Congress on copyright provision and other types of legal barriers which limit the transfer of federally funded computer software and on the feasibility and cost of compiling and maintaining a current and comprehensive inventory of federally funded training software. The report is to identify recurring problems rather than to attempt to compile a comprehensive list of barriers facing individual software projects.

SECTION 6.—REWARDS FOR SCIENTIFIC, ENGINEERING, AND TECHNICAL PERSONNEL OF FEDERAL AGENCIES

This section is identical in the House and Senate versions of this legislation.

SECTION 7.—DISTRIBUTION OF ROYALTIES RECEIVED BY FEDERAL AGENCIES

Both the House and Senate-passed versions of this section direct agencies to retain royalties from the licensing or assignment of inventions and to allocate them to their government-operated laboratories. Both versions have identical limits on the amount of money the laboratories may retain. Both have similar uses to which the laboratory directors may allocate the money, one of which is to reward employees of the agency for innovative work, both in furtherance of the agency's mission and in advancing inventions with commercial potential.

The Senate bill additionally directs agencies to allocate at least 15% of royalties from an invention to the inventor or coinventors, before allocating the remainder to its laboratories. The house had chosen not to include a percentage royalty share, preferring to leave maximum flexibility in rewarding inventors with laboratory management.

The conferees recommend acceptance of a compromise provision, which requires agencies either to allocate at least 15% of royalties from an invention to the inventor or coinventors, or to promulgate regulations providing an alternative set of rights in the inventor whose invention produces royalties for the government.

The conferees believe agencies should have the flexibility to formulate royalty payments to employees that best meet the unique circumstances of each agency and that meet the purpose of the Act. At the same time, the conferees agree that providing a predictable, guaranteed reward from royalties to federally employed inventors provides a strong incentive to report, develop, and help license inventions with commercial potential.

The conferees agree that royalty sharing alone, although effective, is an imperfect tool in promoting technology transfer. The process of turning an invention into a successful commercial product is complex, and involves the work of more than just the inventors. Within a laboratory a team of scientists and engineers, beyond those involved in patenting an invention, may contribute to its development and licensing, and their contribution may be as important to the commercial success of the invention as that of the inventors. In addition, a single, fixed royalty share may be an inadequate reward for an inventor, depending on the amount of royalties received.

Therefore, the conferees believe that laboratory directors should use the authority in section 14(a)(1)(B)(ii) to reward those employees who contribute to innovative work, in mission-related work with or without commercial potential. Similarly, agencies that choose to promulgate rules to set alternative royalty percentages should consider tiered allocation of royalties, which give more weight to the inventor's contribution when royalty income is small, but which also recognize the contributions of a wider team.

In the Federal laboratories, depending on size, a percentage of royalties could be allocated to the research team or project, in addition to the inventor's share, before the remainder is allocated to the Laboratory Director. Such an allocation is possible without formal rulemaking, provided the allocation is in addition to the minimum inventor's share of 15% under clauses 14(a)(1)(A)(i) or (A)(ii).

The initial 15 percent allocation for royalties is to take effect on enactment of the bill unless an agency publishes its intention to promulgate rules. The 15% or any alternative allocation is to apply to all royalty income received by an agency in a given year, including that from inventions patented and licensed before the date of enactment of this Act, and is to continue for as long as the agency receives income from an invention, including after the inventors may have left the agency. The compromise provides that a Federal employee may not receive more than $100,000 per year in royalty income without the approval of the President. This coincides with the limits on agencies' statutory authority to make cash awards to employees.

If an agency's rulemaking is completed within two years after enactment and the 15 percent royalty sharing has not gone into effect, the effective date of royalty sharing under the rule is to be the effective date of the Act. If there is no rule within two years of enactment and royalty sharing is not in effect, 15% mandatory royalty sharing is to go into effect for that agency retroactive to the date of enactment. If a rule goes into effect more than two years after enactment, the effective date of the royalty sharing under the rule for that agency is to be the same as the effective date of the rule.

The conferees wish to stress the flexibility of the compromise on royalty sharing. It is intended to give each agency the freedom to devise different employee award systems that accomplish the purposes of the Act and that best meet the unique needs, cultures, and technology transfer problems of the agencies' laboratories. In order to strengthen the program so that all agencies can benefit from what is learned in the varying approaches to royalty sharing, Comptroller General report has been mandated evaluating the first five years of this royalty sharing program.

The conferees value the licensing activities that have been performed by the National Technical Information Service for other agencies including other parts of the Department of Commerce. Section 14(a)(6) has been added to permit NTIS to continue this work without interruption after enactment.

The conferees are in agreement that there are inherent differences in the way public sector and private sector employees can be rewarded. Furthermore, they have provided agencies with flexibility in the establishment of programs to reward inventors. The conferees, therefore, do not expect any particular agency's approach for rewarding inventors, whether it includes 15 percent mandatory royalty sharing or not, to be viewed as setting a precedent for the private sector.

SECTION 8.—EMPLOYEE ACTIVITIES

The Conferees recommend acceptance of this provision from the Senate version of the legislation as modified. The provision is intended to assure that a Government employee has a chance to obtain title to an invention if the government does not plan to arrange for the commercialization of the invention. The conferees recommend giving the inventor an automatic right to request an invention where the government neither intends to file for a patent nor intends to promote the transfer of this information to the U.S. private sector by alternate means.

SECTION 9.—MISCELLANEOUS AND CONFORMING AMENDMENTS

The only significant difference between the House and Senate versions of these provisions is the Senate's addition of two new responsibilities for Department of Commerce's Office of Productivity, Technology and Innovation. The conferees recommend inclusion of both new responsibilities: promotion of joint initiatives in technology transfer and encouragement of cooperative programs among all appropriate parties regarding development and dissemination of technological skills.

DON FUQUA,
DOUG WALGREN,
STAN LUNDINE,
MANUEL LUJAN, JR.,
SHERWOOD L. BOEHLERT,
*Managers on the Part of the House.*

JACK DANFORTH,
FRITZ HOLLINGS,
DON RIEGLE,
SLADE GORTON,
LARRY PRESSLER,
*Managers on the Part of the Senate.*

S-15131

FEDERAL TECHNOLOGY TRANSFER ACT—CONFERENCE REPORT

Mr. STEVENS. Mr. President, I submit a report of the committee of conference on H.R. 3773 and ask for its immediate consideration.

The PRESIDING OFFICER. The report will be stated.

The legislative clerk read as follows:

The committee of conference on the disagreeing votes of the two Houses on the amendments of the Senate to the bill (H.R. 3773) to amend the Stevenson-Wydler Technology Innovation Act of 1980 to promote technology transfer by authorizing Government-operated laboratories to enter into cooperative research agreements and by establishing a Federal Laboratory Consortium for Technology Transfer within the National Science Foundation, and for other purposes, having met, after full and free conference, have agreed to recommend and do recommend to their respective Houses this report, signed by all of the conferees.

The PRESIDING OFFICER. Without objection, the Senate will proceed to the consideration of the conference report.

(The conference report will be printed in the House proceedings of the RECORD.)

Mr. HOLLINGS. Mr. President, the conference report now before the Senate is a truly historic piece of legislation. At a time when the U.S. economy faces unprecedented foreign competition, the Federal Technology Transfer Act will help government, industry, and academia work together to maintain America's technological leadership.

The Federal Government spends tens of billions of dollars annually on research and development. Federal laboratories alone spend some $18 billion and employ one-sixth of the Nation's scientists and engineers. Of course, the Federal Government makes this huge investment to serve public needs, particularly in the areas of defense, health, and space. But in the process, laboratory scientists and other federally supported researchers create a wealth of unclassified inventions and ideas which, if properly used, could be of enormous help to State governments and American industry. Yet, historically, legal barriers and lack of communication have prevented the private sector and the States from taking full advantage of this important national resource. With international competition so strong, we can no longer afford to ignore this technology.

The Federal Technology Transfer Act is the latest in a series of bipartisan initiatives to reduce these barriers. In 1980, the Stevenson-Wydler Technology Innovation Act directed Federal laboratories to create offices to assist in the transfer of Federal inventions and expertise. That same year, the landmark Bayh-Dole patent amendments gave small businesses and nonprofit organizations, including universities, the right to own and develop inventions that result from federally funded research. Until those amendments, most Federal inventions sat on the shelf, never used by American companies or universities. In 1984, these patent rights were extended to those nonprofit organizations that manage federally supported national laboratories. Already, these new laws are resulting in new products that help industry and benefit the American public.

The bill before us today is an important series of amendments to the original Stevenson-Wydler Act. This bill gives Federal agencies the authority to let their "Government-operated" laboratories—that is, laboratories operated by civil service personnel—enter into cooperative R&D work with industry, State government, universities, and others. For the first time, the Nation's almost 700 Government-operated laboratories will have clear authority to work side-by-side with industry and the States to better utilize unclassified Federal inventions and idcas. The agencies and laboratories will decide for themselves how much, and what kinds, of cooperative work to undertake.

This bill in no way reduces national security controls on classified Federal technology. Nor will it cost the taxpayers an additional dime. Any funds for cooperative research will be provided by the non-Federal partner. In fact,

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this new law will make money for the Government. When a Federal laboratory licenses an existing or new invention to a company, the laboratory may negotiate royalties. Even today the Government receives about $1.8 million per year in royalties from licensing inventions such as the new AIDS blood test. Royalties to the Government should increase under the new legislation.

Besides allowing Government-operated laboratories to work with non-Federal partners, the bill also has several other valuable provisions. It provides modest, stable funding for the

existing network of laboratory technology transfer officers. This Federal laboratory consortium allows a businessman or State official to call their nearest Federal laboratory and, through the network, find out which Federal laboratories throughout the United States have expertise in a given area of technology. The FLC's modest funding is provided not through new expenditures but rather through a small set-aside from the Federal research agencies whose laboratories benefit from the network. The National Bureau of Standards will provide administrative support to the consortium.

The bill also provides that agencies will share some of the royalties earned from Federal inventions with the scientists and engineers who created them. This provision is designed both to reward important work and to provide an incentive for scientists to report patentable ideas which may benefit the country. Agencies are allow great flexibility in designing their royalty-sharing programs.

Finally, the bill contains various conforming and miscellaneous amendments to the Stevenson-Wydler Act.

Mr. President, this conference report results from a remarkable bipartisan effort. The House version of H.R. 3773 passed that body unanimously; its prime sponsors were a Democratic committee chairman and the House Republican leader. A bipartisan group of Senators introduced our version, which later passed this body unanimously. Both the Senate and House have benefited greatly from the work done by the Commerce Department's Office of Productivity, Technology, and Innovation.

Mr. President, all of us who have worked on this legislation see it as a vital step toward better utilizing our national R&D resources in an era of intense foreign economic competition. I am pleased to be an original cosponsor of the Federal Technology Transfer Act, and I urge my colleagues to support this conference report.

Mr. RIEGLE. Mr. President, I am delighted that we and our House colleagues have reached agreement on a conference report for H.R. 3773, the Federal Technology Transfer Act. This important legislation will allow our Federal laboratories to contribute more fully to American industrial innovation and State economic development. At a time when many other countries are challenging our technological leadership, we no longer can afford to ignore the great amount of technology created by the Nation's 700 Federal laboratories.

Federal laboratories exist, of course, to do research in support of Government missions in areas as diverse as agriculture, space, health, and defense. But in the process of serving the Government, Federal scientists and engineers also create a great deal of unclassified technology that could benefit American industry and State development efforts. Over the years, however, less than 5 percent of the almost 30,000 patents granted to personnel in Federal laboratories have been developed into commercial products.

We on the Commerce Committee's Subcommittee on Science, Technology, and Space have long supported efforts to transfer more Federal technology to the private sectors and States. Work on this particular bill began 2 years ago, when it became clear that many Government-operated laboratories—that is laboratories operated by Federal civil service personnel—lacked clear legal authority to enter into cooperative research projects with companies, State agencies, universities, and others. Yet never before have we seen such interest in working with Federal laboratories to commercialize new inventions, to undertake joint research, and to utilize the great expertise of Federal scientists and engineers. Clearly, we needed to reduce the legal barriers that prevent such cooperation.

The conference report before us today is the result of that work. It provides clear authority to Federal agencies to allow their Government-operated laboratories to enter into cooperative research and development agreements with non-Federal partners. It will, in my opinion, open up an entirely new era of American research—one in which Government, industry, and the States work together instead of in isolation of each other.

This bill has several notable features. It gives agencies and laboratories greater flexibility in deciding when to enter into cooperative research ventures, while stating Congress' view that preference should go to ventures which benefit both small business and companies that manufacture within the United States. The bill continues all existing protections for classified information while encouraging our laboratories to share unclassified technology.

This bill will not increase Federal expenditures. The cost of these joint research projects will be borne by the non-Federal partners. In fact, this bill could generate money for the Government by making it easier for Federal agencies to collect royalties on the inventions they license to industry. The legislation also provides rewards to Federal inventors whose ideas result in commercially successful products.

Mr. President, this is an important step toward the better utilization of the taxpayer's investment in Federal technology. The bill enjoys broad bipartisan support, and I urge our colleagues to vote for the conference report.

Mr. BAUCUS. Mr. President, I congratulate the Senate conferees for bringing this conference report to the floor. It is an extremely important bill, because it will do a lot to increase U.S. international competitiveness.

Each year the Federal Government spends $18 billion on research and development conducted at over 700 Federal laboratories. We employ one-sixth of our Nation's scientists in this effort. Yet, 95 percent of the work product of their efforts is unavailable for commercial development.

The Federal Technology Transfer Act of 1986 implements one of the recommendations of the Young Commission Report on Industrial Competitiveness by making it easier to transfer technology out of the Federal labs and into the marketplace.

This bill grants blanket authority to all Federal laboratories to set up cooperative research-and-development agreements with businesses. As Timothy Smith reported in the Wall Street Journal on October 1, 1986, "It will provide money to expand a communications system linking Federal labs, and giving businesses centralized access to a smorgasbord of government research."

Most importantly, the bill will create incentives for Federal researchers to stay on the job by requiring agencies to share at least 15 percent of the royalties received from their patents.

Mr. President, in his book "The Zero Sum Solution," economist Lester Thurow stated that the essence of comparative advantage is not static relative factor endowments or natural resources, but the creation of dynamic technological or efficiency advantages.

Comparative advantage is not something inherited. It's created—as the Japanese are doing now, and as America has done in the past.

The United States used to have the technological edge. It no longer does. While countries like Japan and West Germany coordinate ressearch and development between the public and private sectors and then share the information with their businesses, American policy is to bottle it up and fail to coordinate its use.

The Federal Technology Transfer Act is a major step toward strategic coordination of our research and development that will improve our industries' performance in world markets. I urge my colleagues to support this bill.

Mr. ROCKEFELLER. Mr. President, I am pleased to join my colleagues from the Commerce Committee in urging final passage of H.R. 3773, the Federal Technology Transfer Act.

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This measure is about technological innovation, and about the process of turning inventions into marketable products and services. It recognizes that Federal laboratories represent a promising resource and provides a way to strengthen the links between government scientists and researchers in the private sector.

The Stevenson-Wydler Technology Innovation Act of 1980, which this bill amends, attempted to focus national attention on the issue of technology transfer. Regrettably, it was never fully implemented. But despite the administration's opposition to the act's central feature, a network of government-industry research centers, progress was made within individual agencies to encourage commercial applications of technology developed under their auspices.

Building on this fledgling effort, H.R. 3773 would facilitate cooperative research projects by Federal laboratories and private companies. The Government invests approximately $18 billion on research by Federal laboratories, and much of this work leads to patentable inventions. Yet only a small fraction of these Federal patents are licensed by private industry for commercial use.

In contrast, other countries—particularly Japan—are blazing the trail in the area of technology transfer. They encourage cooperative government-industry research efforts, and actively look for ways to translate the results of promising lines of research into commercially viable products. Japan has been exceptionally adept at identifying technology with commercial potential. And the inventions with commercial promise—the raw material of this process—often comes from us.

This country should be concerned about the implications of a one-way flow of technological information. The current imbalance in the international flow of knowledge is a real threat to our competitive position in a wide range of industries. America's comparative advantage has always been superior technology—our ability to innovate and invent. But we are no longer self-sufficient in technology: without access to technology developed elsewhere, major advances will pass us by.

I am very pleased that the final version of H.R. 3773 incorporates a Senate amendment, which I jointly sponsored with the distinguished majority leader, to improve U.S. access to technology developed with the help of foreign governments. Under the bill, foreign applicants will have opportunities to acquire technology developed in our laboratories—and we think our companies and researchers should get equivalent treatment by other countries in return.

Federal laboratory directors are empowered by this legislation to approve cooperative R&D arrangements and licensing agreements with private industry. Where applications to enter into these agreements come from foreign parties, our provision would permit the laboratory directors to take into account whether or not the countries involved permit U.S. agencies, companies, or other parties to participate in similar arrangements. It would apply to U.S. subsidiaries of foreign companies, as well as to other persons and organizations subject to the control of a foreign government.

We hope, by giving this discretion to our Federal laboratories, to open doors for our corporations and researchers to the work in foreign government-supported laboratories. By making reciprocal access a consideration, we should increase our leverage with foreign research organizations—and gain access to much valuable technical information. If foreign scientists, engineers, and other researchers can have relatively unrestricted access to pathbreaking research at NIH or NASA, it's only right to expect comparable opportunities for our researchers in exchange.

In closing, I consider this legislation an important element of what should be a comprehensive, determined effort to improve the competitiveness of our industries. It will encourage industry to draw on the impressive technological resources and expertise of our Federal laboratories. It will strengthen our national investment in R&D—and help this country gain access to pioneering research and technology developed elsewhere. I'm proud to have worked on this measure and hope it will encourage us to address other aspects of our competitiveness problems with the same imagination and vigor.

Mr. STEVENS. Mr. President, I ask the Senate to adopt the conference report.

The PRESIDING OFFICER. The question is on agreeing to the conference report.

The conference report was agreed to.

Mr. STEVENS. I move to reconsider the vote by which the conference report was agreed to.

Mr. BYRD. I move to lay that motion on the table.

The motion to lay on the table was agreed to.

## H-9399

### CONFERENCE REPORT ON H.R. 3773, FEDERAL TECHNOLOGY TRANSFER ACT OF 1988

Mr. FUQUA. Mr. Speaker, I call up the conference report on the bill (H.R. 3773) to amend the Stevenson-Wydler Technology Innovation Act of 1980 to promote technology transfer by authorizing Government-operated laboratories to enter into cooperative research agreements and by establishing a Federal Laboratory Consortium for Technology Transfer within the National Science Foundation, and for other purposes.

The Clerk read the title of the bill.

The SPEAKER pro tempore. Pursuant to the rule, the conference report is considered as having been read.

(For conference report and statement, see proceedings of the House of October 2, 1986.)

The SPEAKER pro tempore. The gentleman from Florida [Mr. FUQUA] will be recognized for 30 minutes, and the gentleman from New Mexico [Mr. LUJAN] will be recognized for 30 minutes.

The Chair recognizes the gentleman from Florida [Mr. FUQUA].

GENERAL LEAVE

Mr. FUQUA. Mr. Speaker, I ask unanimous consent that all Members may have 5 legislative days in which to revise and extend their remarks on the conference report now under consideration.

The SPEAKER pro tempore. Is there objection to the request of the gentleman from Florida?

There was no objection.

Mr. FUQUA. Mr. Speaker, I yield myself such time as I may consume.

Mr. Speaker, I urge adoption of the conference report on H.R. 3773, the Federal Technology Transfer Act of 1986.

This bill gives us the opportunity to do something very positive about competitiveness, something very positive

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about getting the most out of our tax dollars. By changing the rules on how our Federal laboratories do business, this bill will aid our private sector in many ways at no extra cost to the taxpayers.

The conference report is not dramatically different from the original House-passed version of H.R. 3773. The bill has the same main themes. All federally owned, federally operated laboratories if their parent agency so desires, will be able to contract with private businesses, universities, local governments and others to solve problems of mutual interest. The Federal Laboratory Consortium [FLC] will be formally established at the National Bureau of Standards rather than at the National Science Foundation. However, the Federal Laboratory Consortium will still be the facilitator of the transfer of Federal inventions and ideas into the private sector that was envisioned in the House-passed bill. The bill in its present form still requires all agencies to setup programs to reward their most innovative researchers for their most exceptional contributions both to mission work and to the development of laboratory ideas with commercial potential.

What is new in the bill is a series of expansions, additions, and procedural modifications to the House-passed bill none of which are fundamental in nature. Additional minor responsibilities are given to the Secretary of Commerce and the Federal Laboratory Consortium for technology transfer. Inventors whose inventions produce royalties for the Government are now allowed to share in those royalties under one of two alternate plans. A small Federal Laboratory Consortium program of grants to local technology transfer organizations is established. The House-passed requirement of agency plans for implementation of the cooperative research authority is

dropped in exchange for a series of preferences which accomplish the same purpose. The integrity of the House-passed bill has been preserved and H.R. 3773 indeed has been strengthened by the Senate's and conferees' careful review.

There is one specific subsection I feel could use some additional explanation beyond the statement of managers. The alternate section is intended to give agencies a great amount of leeway in setting up a program of rewarding inventors. Agencies are encouraged to experiment, to setup programs which they feel met their unique circumstances as long as the program includes both a lump sum payment to inventors each year royalties are received on the inventor's invention and also a percentage share of royalties when receipts exceed a level that is set by the agency. For instance, an agency in its discretion could setup a first year lump sum payment amount that is different from the amount paid in subsequent years or it could choose to make its largest lump sum payment to the inventor in the year of licensing rather than when royalties are received and have that payment count toward the requirement of 15 percent of royalties going to the inventor.

In closing, I urge my colleagues to endorse the work of your conference committee.

Mr. LUJAN. Mr. Speaker, I yield myself such time as I may consume.

I rise in strong support of accepting the conference report on H.R. 3773. One of the central themes running through our debates this Congress has been the need to make the United States more competitive economically.

There are many steps that must be taken to achieve that improvement. One of the simplest and most obvious is making better commercial use of the unparalleled advances in basic science and engineering being made in this country.

One example should suffice to show the importance of this step. An article in last week's Wall Street Journal began as follows:

> Clifford Hesseltine's experience as U.S. Government scientist was classic. He did some research on toxins, published results that caught the eye of industrialists with a problem, and won a Government citation for saving an industry.
>
> The citation was the Third Order of the Rising Sun, bestowed on behalf of the Emperor of Japan, in recognition of Mr. Hesseltine's service to Japan's soy sauce brewing industry.

This bill is designed to prevent the recurrence of similar embarrassments in the future. It is the culmination of years of work, going back at least as far as the Packard Commission on Federal laboratories in 1982, which noted the untapped potential of Government laboratories to help American industry.

This bill attacks the problem in several ways. First, it allows Federal laboratories to work with industry, nonprofits, and other levels of government on research and commercialization of inventions. The bill replaces statutory hindrances to cooperation with statutory encouragement.

The bill recognizes the importance and fine work of the Federal laboratory consortium [FLC], the ad hoc organization of Federal labs that acts as a networking agent to promote technology transfer. It gives the consortium a basis in statute, a steady stream of income and a permanent home.

Finally, the bill gives Government employees an incentive to work on projects that have commercial potential.

Although agencies have the authority to make cash awards to innovative scientists, this authority has been little used. In the 31-year period between 1954 and 1985, for example, agencies other than NASA made only nine invention awards that required approval of the Office of Personnel and Management; that is, awards of more than $5,000 before 1978 and more than $10,000 since then.

This bill guarantees that Federal inventors will receive a share of the royalties from the licensing of their inventions. Agencies can either guarantee a 15-percent royalty share to each of their inventors, or can propose an alternative that will give the agencies greater flexibility in deciding how to reward inventors through a combination of lump-sum cash payments and royalty shares. However, under the alternative, total payments to all inventors must exceed 15 percent of an agency's royalty income.

Royalty payments were the stickiest issue in the conference. The Senate wanted to guarantee inventors a share of the royalties. The House wanted to ensure that agencies could tailor royalty payments to the peculiarities of their labs. This compromise fulfills both those goals.

The bill makes clear that royalties should also be used to reward other members of the laboratory team who help bring inventions to commercialization.

At long last, we have a bill that provides both the institutions and the individuals the incentives needed to put our more than 700 Federal labs to work for the American economy. I urge my colleagues to support this conference report.

□ 1730

Mr. LUJAN. Mr. Speaker, I yield such time as he may consume to the gentleman from Illinois [Mr. MICHEL].

(Mr. MICHEL asked and was given permission to revise and extend his remarks.)

Mr. MICHEL. Mr. Speaker, as one of the authors of H.R. 3773, the Federal Technology Transfer Act of 1985, I rise in support of the conference report and strongly urge its adoption.

The Federal Technology Transfer Act is designed to increase research cooperation between Federal laboratories and private entities, and would help clear the way for greater commercial use of the ideas and inventions resulting from such research.

At present, we have some 380 Federal laboratories, in such diverse fields as health, space, energy, agriculture and defense. They spend upwards of $17 billion a year, and employ one-sixth of the Nation's research workers.

Yet, despite this major effort, the National Governors' Association concludes in a recent report that "these national laboratories are far from having begun to realize their full potential as catalysts for close industry-university research cooperation or as collaborators in joint university/industry research."

This is particularly damaging when it comes to our competitive position in the world market. We all know what our trade deficit is. We all know how our position as world leader in the areas of technology, innovation, engineering, and manufacturing has been eroding. While there are many reasons



for this, certainly one of the significant ones is the failure of our industry to consistently translate new technology into competitive products.

But while many companies may not be fully taking advantage of our Nation's research, foreign nations have no qualms in this regard. Much of the research which is not being used domestically is in fact being used abroad. Foreign countries have access to any research that is not patented or licensed for use in this country, and many foreign governments, particularly the Japanese, are taking full advantage of this.

This was brought home graphically to us in my own district, where they tell me that Japanese representatives are frequently seen prowling the halls of the agriculture research lab in Peoria looking for ideas. In fact, one of the scientists in that lab was awarded a medal by the Japanese Government for helping to solve some of their agriculture problems.

Now, I have no problem with our being a friendly neighbor, but when other nations use our research to better compete against us by developing products which they in turn often import back into the United States, I think that's going too far. It's time we take steps to turn this situation around, and that is what this bill is designed to do.

The Federal Laboratory Review Panel of the White House Science Council has recommended greater collaboration between Federal laborato-

ries and industry. But if industry is to become involved and provide resources and capital, it must be able to protect its investment through patent and licensing rights. Without this protection, such investment and ultimate commercialization of a research product will not take place.

I became particularly aware of this problem, and undertook the introduction of this legislation as a result of a collaborative effort that is being undertaken in my hometown of Peoria.

The Peoria Economic Development Council is presently organizing an Agriculture Research and Development Consortium which would pull together a number of corporations involved in agriculture research along with the Department of Agriculture Regional Research Laboratory in Peoria and several universities for the purpose of undertaking combined research endeavors. It is also expected that venture capital will be provided to turn the research findings into usable commercial products. The potential for jobs and new business investment is considerable.

I should also mention that the Illinois Legislature has enacted legislation which provides $50 million in low-interest bond funds for agriculture research and development. This indicates the importance which the entire State of Illinois places on cooperative research endeavors. For this State program to become effective, Congress must enact this measure.

This bill will help us become more competitive in the world market, increase the use of federally funded research, and assist in the creation of additional jobs in this country.

The conference report represents a reasonable compromise between the House and Senate versions of the bill. The most controversial area was the issue of whether a specified royalty percentage should be awarded to Federal inventors, as the Senate provided, or whether it should be left up to the laboratories—the House position. The conference report comes down closer to the Senate position, in that it goes with a 15-percent royalty sharing percentage for the inventor, but waives that provision if an agency chooses to develop its own plan for rewarding inventors.

Some business groups seem to feel that such a mandated royalty percentage would set a standard which the private sector would have to follow as well. I don't think that's the case. I know that's not the intent of the conferees. Besides, most businesses normally allow Government practices to be used as precedents only when it serves their own interests, so I think some of the expressions of concern in this regard ring a little hollow.

This is a good conference report which will enhance our Nation's competitive position, and I urge its adoption.

Mr. Speaker, I certainly want to compliment the chairman, the distinguished ranking member, and the gentleman from New York [Mr. LUNDINE], the gentleman from Florida [Mr. FUQUA], the gentleman from New Mexico [Mr. LUJAN], and the others who have been so helpful in getting this legislation moved through the Congress and finally to see its full fruition by way of the conference report.

Mr. LUJAN. Mr. Speaker, will the gentleman yield?

Mr. MICHEL. I yield to the gentleman from New Mexico.

Mr. LUJAN. Mr. Speaker, I just want to take this time to congratulate the gentleman on introducing this legislation. It is something that has been needed for a long, long time. That is the way to get technology out into the private sector and for the benefit of our citizens, and so I congratulate the gentleman on introducing this legislation.

Mr. MICHEL. I thank the gentleman. It was a pleasure for me to testify before the committee earlier in the year, and I just felt all along that as a government we really had our head in the sand by doing all this research for which I was responsible in part for helping to fund through the Appropriations Committee process for many years, and then seeing that research simply lying on the shelves, for what reason we do not know. Now we are bringing it together, hopefully to put it to good work, and I am very happy to see it all happen.

Mr. FUQUA. Mr. Speaker, I yield myself such time as I may consume.

Mr. Speaker, I would also like to join in my compliments to the distinguished minority leader for his efforts in bringing this bill about, and hopefully, as he elucidated in his comments, we will bring about, as a result of that, more information becoming available in the marketplace so that it can be commercialized.

I again congratulate the gentleman, and express my thanks for his support and help.

Mr. Speaker, I yield 3 minutes to the gentleman from New York [Mr. LUNDINE], a distinguished member of our committee.

(Mr. LUNDINE asked and was given permission to revise and extend his remarks.)

Mr. LUNDINE. Mr. Speaker, I rise today to urge the adoption of the conference agreement accompanying H.R. 3773, the Federal Technology Transfer Act of 1986. This legislation is designed to promote technology transfer from the Federal laboratories and represents a reasonable compromise between the legislation passed by the House last year, and the measure adopted in the other body in August. It enjoys strong bipartisan support in both Houses and deserves our approval here today.

It is clear that if the United States is to regain its position in the international marketplace, we will have to do a better job of translating new technology into competitive products. One way the Federal Government can contribute to this process is by promoting more effective utilization of technology produced by Federal laboratories. The Federal Government funds approximately half of this country's total research and development and much of this work is performed in Government-owned laboratories. The President's Commission on Industrial Competitiveness agreed and recommended that the Federal Government manage its research and development with more concern for commercial application and competitiveness.

In my view, the Federal Technology Transfer Act takes a step in this direction by promoting more effective utilization of the technology produced by Federal laboratories and encouraging cooperative research agreements between government operated laboratories and industry. The scientific and engineering expertise, the technology base, and the facilities and equipment within these laboratories are valuable national resources. This legislation allows these resources to be more readily shared with private companies wishing to develop new products and with local governments in need of technical solutions to their problems.

First, H.R. 3773 would give Federal agencies clear authority to permit their laboratories to conduct cooperative research with universities, industry, industrial development organizations, units of State and local government and others. Interest in cooperative research is increasing especially from State and local technology transfer organizations. These relationships should be encouraged and easier access to Federal technology permitted.



These cooperative agreements would be subject to a few conditions as proposed in the House measure. In negotiating agreements, preference must be given to business units located in the United States which agree that products embodying inventions made under the cooperative research and development agreement will be manufactured substantially in the United States. I feel that taxpayer-supported Federal technology should be used to create jobs and income at home, not abroad. A small business preference is also included.

In addition, Federal laboratories would have the authority to negotiate patent rights and licensing agreements with the collaborating party in an agreement.

Second, to further promote technology transfer from the Federal laboratories, the proposal formally recognizes the Federal Laboratory Consorti-

um for Technology Transfer. The consortium is currently an ad hoc organization of representatives from over 300 Federal laboratories representing 11 Federal agencies. It has been the principal body during the last decade for networking between Federal laboratories and for facilitating technology transfer from the Federal sector. The effectiveness of the Federal Laboratory Consortium has been limited only by the resources available to it as an ad hoc organization.

H.R. 3773 recognizes the important contributions being made by the Federal Laboratory Consortium and the need to enhance the consortium's capabilities. This is accomplished by providing a temporary source of funding for the FLC and a Washington presence within the National Bureau of Standards, not by altering the present nature of the consortium as an organization of technology transfer officials from throughout the Government.

Finally, the proposal will provide incentives for Federal laboratories and their employees. Agencies will share some of the royalties earned from Federal inventions with the scientists and engineers who created them and with their laboratories. At the same time, agencies will have some flexibility in designing their awards programs.

If this authority is used effectively, incentive awards programs will encourage creativity and innovation among scientists, engineers, and technical personnel of the Federal Government. They will also boost employees morale and productivity by making individuals aware that their contributions to technology transfer are important.

In conclusion, I believe that this country's ability to provide high quality jobs and a higher standard of living for ourselves and our children depends on how well we promote technological innovation. The measure before us today is a step in the right direction. It will help put technology to work to create jobs and I strongly urge its adoption.

□ 1740

Mr. LUJAN. Mr. Speaker, I yield such time as he may consume to the gentleman from New York [Mr. BOEHLERT].

(Mr. BOEHLERT asked and was given permission to revise and extend his remarks.)

Mr. BOEHLERT. Mr. Speaker, I rise in strong support of this conference report. The Technology Transfer Act of 1986 is designed to improve our economic competitiveness by tapping the talent that has been somewhat bottled up in our 700 some-odd Federal labs.

The United States continues to be the world leader in scientific research, yet, disturbingly, we lag behind our allies in applying the fruits of our research. American science and technology has been more often transferred overseas than around the corner.

This bill should reverse that situation. It encourages Federal laboratories and their scientists to work more closely with private industry and to be sensitive to the commercial applications of their work.

The bill also would provide a permanent home and a predictable source of funding for the Federal Laboratory Consortium. This group has been doing an exemplary job of bringing Federal science to the outside would, despite the organization's fragile, ad hoc structure.

The House and Senate committee staffs have labored long and hard to hammer out a compromise that provides definite economic incentives to promote technology transfer, while allowing each laboratory to tailor the system to its needs.

Mr. Speaker, I think this conference report and the whole bill, the whole process demonstrates what positive can be accomplished through good, bipartisan cooperation. What we have before us today is a tribute to the innovativeness and to the tenacity of the distinguished minority leader, the gentleman from Illinois [Mr. MICHEL] and the gentleman from New York [Mr. LUNDINE] my colleague on the committee. We need this bill to help our economy and I urge my colleagues to support it.

Mr. WALGREN. Mr. Speaker, I rise to support acceptance of the conference report on H.R. 3773, the Federal Technology Transfer Act of 1986 and urge my colleagues to give this legislation their wholehearted support.

For most of the 20th century the United States has been the undisputed world leader in new product development. When we studied history as school children we learned of the many American inventors who came up with the products and processes that make up modern life. These Americans, often from humble beginnings through sweat and tenacity transformed an idea into a commercial product and sometimes into a major company bearing their name.

Recently, we have slipped. While we still are probably the most creative people in the world, we have lost something in the implementation phase. All too often an American invention, like the videocassette recorder, becomes a commercial reality overseas rather than here at home.

In H.R. 3773 we partially address this problem by making the national laboratories more available to American industry. One out of six American scientists and engineers works for the Federal Government in a Federal laboratory. These 700 laboratories with a combined budget of over $18 billion wrestle with every kind of scientific problem imaginable ranging from a better understanding of the basic laws of physics to the problems of modern manufacturing. Yet foreigners seem to be more aware of this gold mine of ideas than Americans do. Lab employees frequently tell us that while the Japanese are constantly at their doors, it is relatively unusual to find American companies looking to them for new ideas to develop.

H.R. 3773 looks to correct this problem in a number of ways. It authorizes all Federal laboratories, with their agency's consent, to enter into cooperative research arrangements with U.S. industry, universities, local governments, and other interested parties to solve problems of mutual interest. It enhances the position of technology transfer officers in the Federal laboratories with the goal of increasing the number and quality of ideas moved from the laboratories into the American private sector and into commercial development. It formalizes a voluntary association of Federal laboratories called the Federal Laboratory Consortium for Technology Transfer (FLC). FLC is given money through a set-aside to become a clearinghouse for businessmen with technical problems and to continue its present activities including teaching technology transfer officers to do their jobs better. H.R. 3773 also provides rewards to creative people in the laboratory for contributions to the mission of the laboratory and royalty sharing for inventors whose ideas bring income to the Government.

H.R. 3773 is clearly a significant step in the right direction and a bill we approved unanimously last year. Let's vote for a more competitive America by approving the conference report.

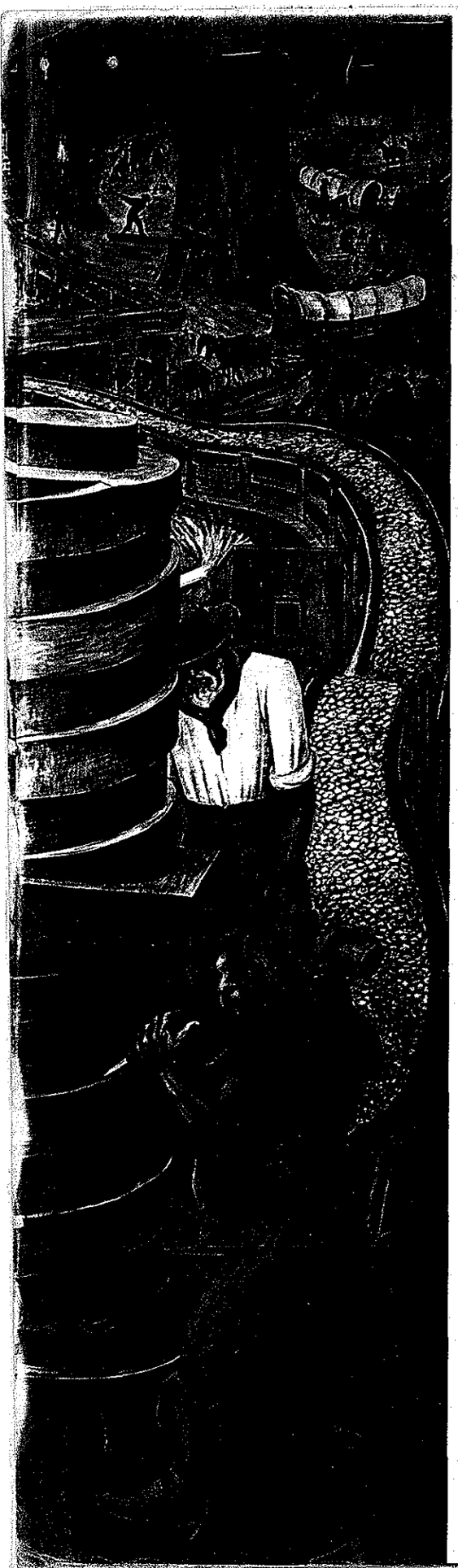
Mr. LUJAN. Mr. Speaker, I have no further requests for time, and I yield back the balance of my time.

Mr. FUQUA. Mr. Speaker, I have no further requests for time, I yield back the balance of my time, and I move the previous question on the conference report.

The previous question was ordered.

The conference report was agreed to.

A motion to reconsider was laid on the table.



# INVENTING THE HISTORY OF INVENTION

## Three Big Thinkers Who Placed Technology at the Heart of History

by Arthur P. Molella

THE HISTORY OF TECHNOLOGY WAS OFFICIALly born in the United States in 1958, when the Society for the History of Technology was established. But long before the subject donned that academic cloak, three lone pioneers virtually invented it, writing histories that took on the human and moral dimensions of technology in the broadest way. The Harvard economic historian Abbott Payson Usher published *A History of Mechanical Inventions* in 1929. That same year the literary and social critic Lewis Mumford began the first draft of what would eventually become his masterpiece, *Technics and Civilization*, published in 1934, and simultaneously a Swiss art historian named Sigfried Giedion began a sweeping work that appeared in America in 1948 as *Mechanization Takes Command*. Together these men opened up a whole new, vital side of history and pursued it with a breadth of purpose that some critics complain isn't being emulated by anyone today. They were the founding fathers of their field.

Books on the history of invention had appeared as far back as the fifteenth century, but the literature had consisted mainly of narrowly focused,

**Industry dominates the landscape in Diego Rivera's 1941 mural *Pan American Unity*.**

CITY COLLEGE OF SAN FRANCISCO

technical chronologies, handbooks, and encyclopedias written for engineers and inventors. Rarely had they raised the larger social issues surrounding the emergence of technology. In contrast, Usher, Mumford, and Giedion set a far-reaching intellectual and moral agenda. Their classic writings, still in print, continue to inspire students of the field, posing questions that properly remain at the center of the discipline. Yet except for Mumford, who is enjoying something of a revival these days, little is commonly known about these men and what led them to the field and how they shaped it.

Although they began their books at the same time and were aware of one another's writings, Usher, Mumford, and Giedion worked independently. They had very different approaches to the history of technology, reflecting their disparate personal and professional backgrounds. Nonetheless, their books elaborated a number of common themes, most fundamentally a central concern with how man has reconciled the needs of the human spirit with the brute material conditions of existence. They all saw technology as the crux of this reconciliation.

Themes of reconciliation were of the utmost urgency to the generation shaped by World War I. The war had provoked intense questioning about what technology was doing to society and to culture. Traditionally regarded as a force for good, technology had come to be associated with war, the shattering of the past, and a present clouded by automation and the prospect of human enslavement by machines. And there were clearly no simple answers. Those who feared that the automobile, the airplane, the radio, and automated mass production would usher in an era of ugly materialism and submission to technology also saw new technology-bred possibilities for democratic opportunity and national community.

In coming to terms with such issues, Usher, Mumford, and Giedion all remained confident that if properly controlled and directed, technology could support rather than erode human values. The most hopeful sign of all was a general trend they perceived, beginning at the turn of the twentieth century, toward an organic rather than mechanical view of things—in technology and in the sciences and humanities as well. A vision of the world that saw the similarities and interrelatedness between natural organisms, modern man, and machines might hold untold possibilities for laying the foundation for a more humane technological society.

**Usher saw technology not as an outside force afflicting man but as a deeply creative human enterprise.**



**Abbott Payson Usher in the 1910s, when he was teaching at Cornell University.**

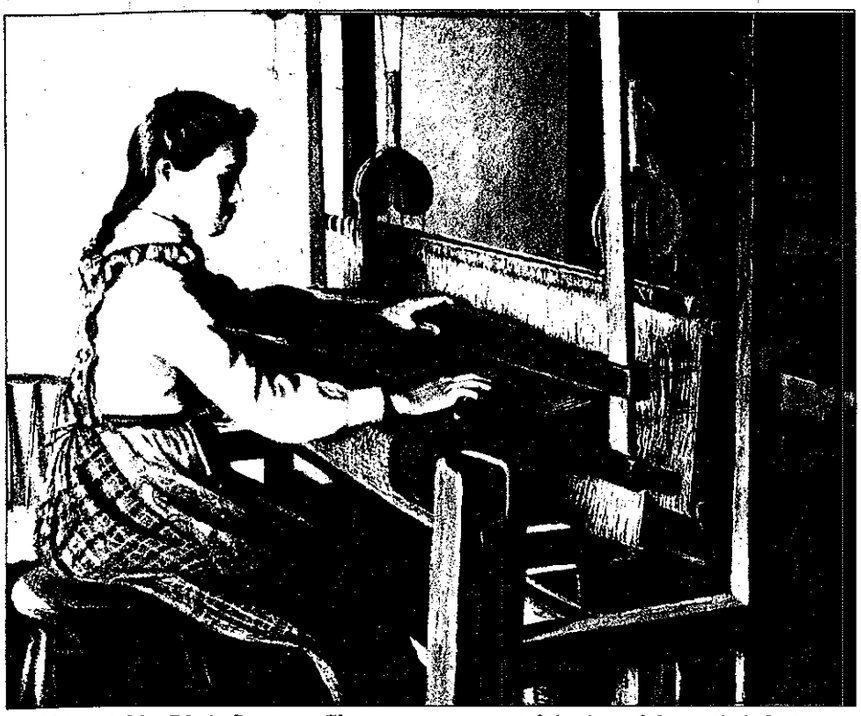
COURTESY OF MIRIAM USHER CHRISMAN

### Abbott Payson Usher (1883–1965): Technology as Adaptation

A. P. Usher was the least vivid personality among this trio of historians, but some of his ideas were the most advanced, in ways still not widely appreciated. Born in Lynn, Massachusetts, he was the son of Edward Preston Usher, a prominent New England lawyer, author, and railroad entrepreneur who built one of the earliest interurban electric lines in Massachusetts. Like his father, A. P. Usher was educated at Harvard. Except for a decade "in exile" at Boston University and Cornell, he spent his adult life teaching economics there.

As a young professor at Harvard, Usher imbibed heavy doses of German and French social and economic history. The teaching of these subjects, strongly influenced by Marxist historiography, stressed the role of the physical environment—geography, natural resources, and climate—in the development of society and culture. Usher himself pioneered what became known as the "new economic history," emphasizing quantitative and scientific measures of economic change, and he stressed the importance of the Industrial Revolution in shaping Western economic development. In 1920 he wrote a textbook on the Industrial Revolution and took the innovative step of putting technology front and center in it, while most economic historians treated the rise of industrial technology as a secondary influence or even caricatured it as the mere product of heroic inventors.

After a decade of study Usher came forth with a book whose focus on technology surprised his colleagues, *A History of Mechanical Inventions*. A difficult treatise, it traced in exquisite detail the development of inventions including the water wheel, mechanical



A 1906 pastel by Edwin Romanzo Elmer conveys a nostalgic view of domestic industry.

clocks, spinning and weaving machines, the steam engine, and other prime movers. Usher saw similar stages in the emergence of each of these technologies and viewed them all not as the miraculous achievements of a few inspired individuals but as the accumulated sums of many small improvements by largely anonymous inventors and skilled artisans.

Most of *A History of Mechanical Inventions* was highly technical, and the book set a standard for narrowly focused history—precisely the kind for which today's historians of technology are sometimes criticized. Why, then, does Usher count as a "big thinker"? The answer lies in the book's opening chapters, in which he placed technological history in perspective. Usher wrote of a dangerous conflict growing between material and spiritual values as the world became more mechanized, but he also evinced a fierce belief in the possibility of a benign outcome, in humanity's power to improve its situation through the intelligent, responsible application of technology. To him, technology was not at all an external force oppressing society but rather a cultural product of that society, for good or for ill.

Usher agreed with the French and German social historians and geographers who had influenced him that the dynamics of civilization resulted from the interplay between humans and their material environments. But he thought that his forebears, especially the Marxists, went too far when they portrayed mankind as a passive victim of material forces, including the forces of mass production. He emerged from his studies a fervent anti-Marxist.

Usher viewed the study of the history of technology as an antidote to all kinds of determinism. He elaborated this view in a theory of innovation that portrayed technology as a deeply creative human enterprise. Adapting ideas from the newly introduced theory of gestalt psychology, he maintained that invention was not a step-by-step logical process but the complex fruit of the unconscious mind's ability to perceive and form patterns, or gestalts. Applied to technology, gestalt theory drew attention to the inventor's aesthetic, emotional, and spiritual sides.

Gestalt psychology was explicitly antimechanistic. It was heavily influenced by developments in theoretical physics, especially by quantum mechanics and relativity theory, which seemed to challenge the Newtonian mechanical view of nature with a more

## THE INVENTOR'S GESTALT

The process of innovation has frequently been held to be an unusual and mysterious phenomenon of our mental life. It has been long regarded as the result of special processes of inspiration that are experienced only by persons of the special grade called men of genius. This mystical account of these phenomena is, however, gradually yielding ground before the growing body of psychological analysis. . . .

Our mental processes fall into two types; the synthetic, constructive, and creative activities concerned with innovation; the analytical, imitative, and conservative activities concerned with the formulation and imposition of tradition. A comprehensive theory of innovation would involve by necessity all the synthetic activities, but it could not be confined to them because the analytical activities are called into play. . . . It will now be desirable to give more attention to the details of the experiences involved in the process of invention. The experience is closely associated with the disposition of the mind to see things whole. We do not first perceive all the separate elements of an experience, and then subsequently combine them into an organized group. The whole mass of data is experienced as a unit, more or less satisfactory and complete. Such is the view of an important school of psychologists. . . . It is a great misfortune that there is no wholly adequate term to apply to this notion. In German the word *gestalt* is used; in English, *configuration*; but neither of these terms is sufficiently vivid or certain in its connotation.

***—A History of Mechanical Inventions*, by Abbott Payson Usher**

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organic and holistic perspective.

Usher was one of the first scholars to apply gestalt principles to a subject other than psychology, and his attempt confused some of his readers. One reviewer of *A History of Mechanical Inventions* saw "no excuse at all for the psychological involutions of chapters one and two, which are enough to fend off almost any reader from an otherwise fascinating book." But for Usher, applying psychological theory to technological history reinforced a crucial link between the spiritual and the concrete.

Usher was ultimately working toward not just a history of invention but a comprehensive social theory. He quickly extrapolated, from his gestalt theory of technical innovation, a broader conception of social change, in which societies constantly interact with the physical environment in a complex, essentially biological fashion. Technology had to be seen as a form of organic adaptation. His goal in *A History of Mechanical Inventions* was to point the way toward a study of social change on an organic model. Paradoxically, although Usher described his method as "empirical" and frankly experimental, his writings revealed a penetrating theoretical mind at work. He never fully made the case for a new theory of social history in *A History of Mechanical Inventions*, but he mapped out a way that future social historians might follow.

## Lewis Mumford (b. 1895): The Stages of History

Whereas Usher addressed his writings on technology and society primarily to scholarly specialists, Lewis Mumford ventured into the subject as a social critic with a broad general audience.

Born in Flushing, New York, Mumford at first aimed for a career in electrical engineering. He attended Stuyvesant High School, in Manhattan, where science, technology, and the industrial arts were emphasized, and there obtained the basic technical background he would need to write his masterpiece, *Technics and Civilization*. While at school he tinkered with model airplanes and radio sets.

**Mumford believed that mechanization had reached its brutal peak; in the new era man and machine might be reconciled.**




**Lewis Mumford on the cover of *Time*, 1938.**

He even sent in some ideas for inventions to Hugo Gernsback's popular-science magazine *Modern Electrics*. But then he decided to take a broader view and pursue a career as a writer and cultural critic.

Although his first several books were devoted to literary, art, and architectural history, they were steeped in the issues of the machine age. As a student at the New School for Social Research and an editor of the literary magazine *The Dial*, he worked closely with Thorstein Veblen, a trenchant critic of industrial capitalism, and acquired a taste for leftist ideology. But his principal intellectual influence was an eccentric Scots biologist, sociologist, and city planner named Patrick Geddes. It was Geddes, Mumford's "master," who introduced him to a view embracing science, technics (a now-obsolete word for technology), and society and who convinced Mumford that the human spirit must be constantly reinforced in the face of brutalizing, dulling technology.

Criticisms of technology began creeping into Mumford's writings in the 1920s, as he bemoaned the spiritual damage being wrought by the regimentation and routinization of mass production. In a similar vein, he criticized modern architecture as a style suitable for robots, not human beings. His famous thesis that the clock and the discipline imposed by precise timekeeping, not the steam engine, were at the root of the Industrial Revolution first appeared in his 1926 book *The Golden Day: A Study in American Experiences and Culture*.

Mumford focused specifically on technology for the first time in a brief article entitled "The Drama of the Machines," in *Scribner's* magazine in 1930. The article helped win him the opportunity in 1931 to deliver an extension course on the machine age in America, at Columbia University. According to Mumford, it was the first such course given in America. At the same time, he threw himself into the research for and writing of *Technics and Civilization*, a work that set the pattern for the remainder of his literary career.

To prepare to write *Technics and Civilization*, he set out in 1932 for Europe and toured the national technical museums in Paris, Vienna, London, and Munich, where he could see the major artifacts of the Industrial Revolution. He was most impressed by the lively exhibits at the Deutsches Museum, in Munich, whose library introduced him to the extensive German literature on the history of invention.

*Technics and Civilization* appeared two years later. It presented a grand historical progression of three successive technological phases, and in so doing effectively moved the birth date of the Industrial Revolution from the eighteenth century back to the Middle Ages: "For the last thousand years



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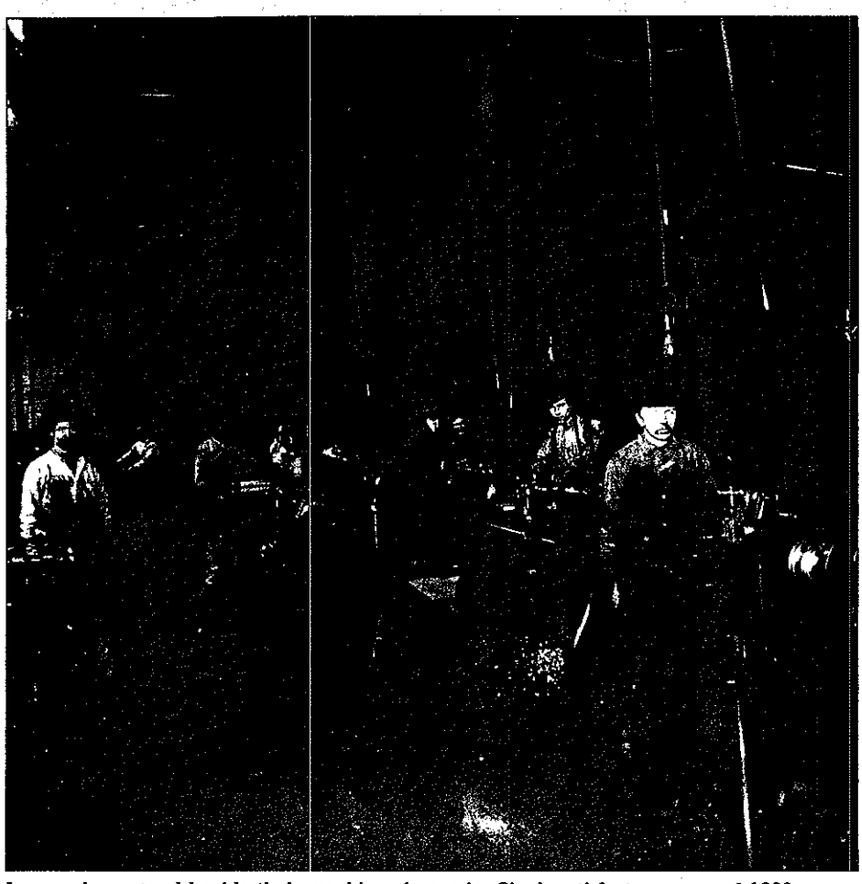

**Ironworkers stand beside their machines in a grim Cincinnati factory, around 1889.**



**Rows of men and women work with belt-powered machine tools in the screw room at the Elgin National Watch Company, in Elgin, Illinois, May 1899.**

## A NEW WAVE SWELLS UP

The machine has swept over our civilization in three successive waves. The first wave, which was set in motion around the tenth century, . . . was an effort to achieve order and power by purely external means, and its success was partly due to the fact that it evaded many of the real issues of life and turned away from the momentous moral and social difficulties that it had neither confronted nor solved. The second wave heaved upward in the eighteenth century after a long steady roll through the Middle Ages. . . . In the course of this effort, various moral and social problems which had been set to one side by the exclusive development of the machine, now returned with doubled urgency: the very efficiency of the machine was drastically curtailed by the failure to achieve in society a set of harmonious and integrated purposes. External regimentation and internal resistance and disintegration went hand in hand: those fortunate members of society who were in complete harmony with the machine achieved that state only by closing up various important avenues of life. Finally, we begin in our own day to observe the swelling energies of a third wave: behind this wave, both in technics and in civilization, are forces which were suppressed or perverted by the earlier development of the machine. . . . As the result of this third movement, the machine ceases to be a substitute for God or for an orderly society; and instead of its success being measured by the mechanization of life, its worth becomes more and more measurable in terms of its own approach to the organic and the living.—***Technics and Civilization*, by Lewis Mumford**

TOP: COURTESY OF CINCINNATI HISTORICAL SOCIETY; BOTTOM: COURTESY OF CHICAGO HISTORICAL SOCIETY

there has been a constant technological progress. This has had three phases, and more roughly three time periods: the eotechnic (wind and water and wood complex) from 1000 to 1750; the paleotechnic (coal and iron and steam) from 1700 to 1900; the neotechnic (electricity and the hard alloys and the lighter metals) 1820–?"

For Mumford, "progress" was a problematic concept. He acknowledged that technology itself progressed, but he worried about what that progress meant for social and spiritual progress. For him, technology was both cultural cause and cultural effect, with technology and culture reinforcing each other. At the root of society's mechanization lay Western capitalism, with its demand for regimentation and objectivity. Technics had responded to capitalism with the invention of the mechanical clock, which, in turn, had reinforced social mechanization, and so on. The mechanization of technics and the concomitant mechanization of humanity had reached their brutal peak in the paleotechnic era, which Mumford identified roughly with the Industrial Revolution. The attempts to reduce human beings to machines to serve the needs of mills and factories had alienated mankind from nature and ultimately from its own humanity.

While Mumford understood the destructive effects of mechanization, he also, unlike some of his despairing contemporaries, saw hope. He found inspiration in the history and philosophy of science, which he read avidly, and especially in the writings of the British philosopher Alfred North Whitehead, author of the influential *Science and the Modern World*. According to Whitehead, the revolutions of relativity and quantum mechanics had spelled the demise of the old mechanical world view, replacing it with an organic concept of nature. This revision of the underpinnings of both physics and biology put human beings back into nature and pointed toward more humane science and technology.

As Mumford saw it, the pendulum had made a full swing: "Up to the neotechnic period technological progress consisted in renouncing the organic and substituting the mechanical. This reached its height around 1870. Since then the new trend, visible in technics as well as in philosophy as in social life, is the return to the organic by means of the mechanical: a return with a difference, namely with the whole body of machines and analytical knowledge we have acquired along the way." In "organic mechanism"—a melding of mechanistic and organic conceptions—lay the hope for an ultimate reconciliation of the machine and the human spirit.

**For Giedion, such diverse achievements as relativity, cubism, and skyscrapers embodied common basic truths about the culture.**



**Sigfried Giedion, about 1917.**

### Sigfried Giedion (1888–1968): Machines and the Spirit of the Age

A sense of cultural crisis and hope also informed the writings of the Swiss art historian Sigfried Giedion, whose temperament combined Mumford's reformist zeal with Usher's sense of scholarly purpose.

Born in Prague to Swiss-Jewish parents, Giedion earned an engineering diploma from the University of Vienna at the behest of his father, who wanted him to take over the family textile business. Spurred on by more artistic desires, he then went to Munich and pursued a doctorate in art and architectural history with the renowned Swiss scholar Heinrich Wölfflin. All his subsequent writings revealed a determination to find an outlook that fused the artistic with the technological.

In the late 1920s and early 1930s, Giedion undertook a massive project to write a historical treatise titled *The Origins of Modern Man*. The ideological basis for this work was the modernism embodied in the teachings of the Bauhaus. Founded in Weimar, Germany, in 1919, the Bauhaus school of design promoted a gathering and unifying of art, craftsmanship, and engineering design into a new functional architecture. Giedion, a close friend of the architect and Bauhaus founder Walter Gropius, became a leading propagandist for the movement. He befriended artists such as Paul Klee, whose avant-garde paintings strongly influenced Giedion's ideas about technology and culture.

As the first part of his ambitious work, Giedion began in the 1930s a manuscript titled *Konstruktion und Chaos*, a later version of which became *Mechanization Takes Command*. Although the latter was not published until 1948, Giedion was already deeply involved with questions of mechanization and society when Usher and Mumford were formulating their views. The Nazi takeover in Germany interrupted his work and cost him his European



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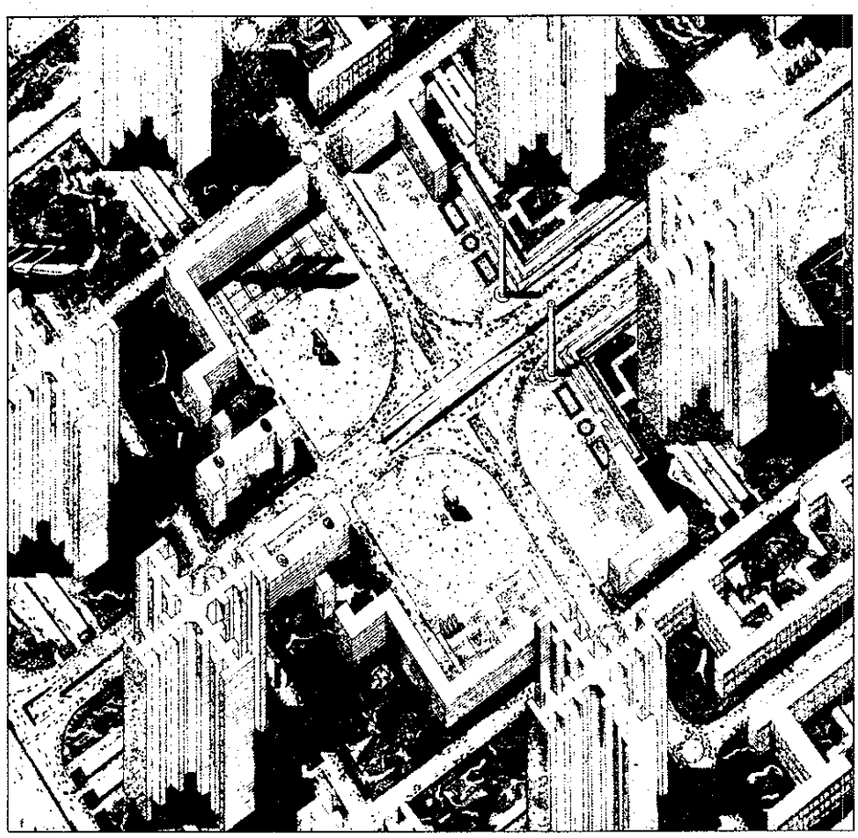


**Giedion's friend the architect Le Corbusier planned this "Ville Radieuse" for Paris.**

audience: many of his close friends and colleagues, including Gropius, fled to America.

Soon after Gropius arrived in this country, he invited Giedion to deliver a series of lectures at Harvard, which were eventually published as the influential and popular modernist manifesto *Space, Time and Architecture*. Staying on in the United States, Giedion became fascinated by American industry, especially by its extraordinarily rapid mechanization in the nineteenth century. Although he had difficulty finding an American teaching post, he resolved to write in English for American audiences. And he focused his writings on the American scene.

*Mechanization Takes Command*, intended to complement *Space, Time and Architecture*, concentrated on the problems arising from the cultural assimilation of machines. Giedion believed that modern mechanization had engendered a broad split between "thought" and "feeling," which implied similar dichotomies between science and art, reason and emotion, and form and function. Finding ways to heal these cultural wounds became the primary goal of *Mechanization Takes Command*.

The book is built around a series of moralistic, meticulously researched case studies, including a now-famous account of the development of mass-production techniques in Cincinnati slaughterhouses. The "disassembly line," as graphically depicted in *Mechanization Takes Command*, subjected organic matter—pigs, sheep, and chickens—to unyielding inorganic forces, automated machines that butchered the spirit as well as the body.

The excesses of mechanization, Giedion argued, created a cultural imbalance epitomized by the cruelty of the automated abattoir; a healthy culture would depend on an equilibrium among cultural components, artistic and spiritual as well as scientific and technological. Like Mumford, Giedion looked to new scientific developments for solutions, and he detected possibilities for cultural healing in modern physical and biological theories. In such theories, he wrote, "we find a

## THE SUN IN A COFFEE SPOON

History is a magical mirror. Who peers into it sees his own image in the shape of events and developments. It is never stilled. . . . The meaning of history arises in the uncovering of relationships. . . . The historian deals with a perishable material, men. . . . His role is to put in order in its historical setting what we experience piecemeal from day to day, so that in place of sporadic experience, the continuity of events becomes visible. . . . History, regarded as insight into the moving process of life, draws closer to biological phenomena. We shall speak little, here, of general lines and great events, and then only when necessary to connect occurrences with the bedrock in which they are rooted.

We shall inquire in the first line into the tools that have molded our present-day living. We would know how this mode of life came about, and something of the process of its growth.

We shall deal here with humble things, things not usually granted earnest consideration, or at least not valued for their historical import. But no more in history than in painting is it the impressiveness of the subject that matters. The sun is mirrored even in a coffee spoon.

In their aggregate, the humble objects of which we shall speak have shaken our mode of living to its very roots. Modest things of daily life, they accumulate into force acting upon whoever moves within the orbit of our civilization.

The slow shaping of daily life is of equal importance to the explosions of history; for, in the anonymous life, the particles accumulate into an explosive force.—***Mechanization Takes Command*, by Sigfried Giedion**

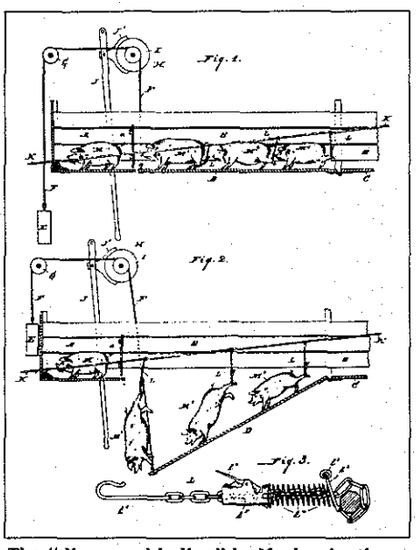
COURTESY OF NEW YORK PUBLIC LIBRARY

departure from the investigation of an isolated process, from purely mechanistic conception of the world." In unpublished writings, Giedion ruminated on the philosophical implications of relativity and quantum mechanics, according to which the "cosmos is beginning to resemble more and more one great thought." He detected a reversal of the trend toward viewing organic phenomena in mechanical terms and the beginnings of a movement toward organic unification, ultimately a convergence of art, technology, and life. "The central feature or character of the cosmic movement," he speculated, "is therefore toward wholeness."

Despite such mystical-sounding speculation, *Mechanization Takes Command* deals primarily with humble things. Pursuing what he termed "anonymous history," Giedion focused on the work of unknown innovators and everyday objects, especially the odds and ends of mass production: the Yale lock, the vacuum cleaner, bathroom fixtures, the bread we eat. In addition to visiting museums and manufacturing sites, he mined company records, patent files, and patent-model collections. Like Mumford and Usher, Giedion was a self-proclaimed "empiricist," who believed in going out into the world and seeing it for himself. The rewards for massive personal research should be substantial, he felt, for commonplace artifacts have a cumulative cultural effect. They stamp an age and a culture more indelibly than the occasional discoveries of a few celebrated inventors.

Without an understanding of its broad purpose, *Mechanization Takes Command* can seem an eccentric volume indeed, almost amorphous in its diverse array of subjects. Giedion's aim was not to trace an evolutionary succession of technological devices but to induce from a myriad of objects what was "essential" and what was "transient" to an age. The essential would reflect a central unified conception, embracing the truths of science, technology, philosophy, and the arts. Even such diverse achievements as the theory of relativity, cubist art, and the skyscraper embodied interrelated truths. Every object manifested a central conception or idea—the spirit of the age. According to Giedion, "the sun is mirrored even in a coffee spoon."

**Western thought had reduced organisms to mechanisms; these three men wanted to work in the opposite direction.**



**The "disassembly line" in *Mechanization Takes Command* begins with this device "for catching and suspending hogs."**

*Mechanization Takes Command* bore a close kinship to Giedion's writings in the history of art and architecture, which in turn reflected his debt to his teacher Heinrich Wölfflin, heir to the thought of G. W. F. Hegel, Germany's great idealist philosopher. There is indeed a distant but direct relationship between Giedion's spirit of the age and Hegel's world spirit. But the beauty of *Mechanization Takes Command* is its determination to see the universal in the particular, resulting in a unique approach to the history of technology that dealt not with such spectacular artifacts as locomotives or steam engines but with coffee spoons, cups, chairs, and bathtubs—important in their own right as physical manifestations of the human spirit.

*A History of Mechanical Inventions*, *Technics and Civilization*, and *Mechanization Takes Command* are works of impressive scholarship and originality, and they opened up new historic vistas when they were written. Their unique power derives from the fact that their authors were grand thinkers in pursuit of sweeping moral and cultural truths. The appearance of these classic histories was itself a historical phenomenon, a response to the concerns and anxieties of the perilous time between world wars. Usher saw technology not as an antihuman force but as a means of liberation; Mumford portrayed humanity at the mercy of machines but saw hope in a new neotechnic age; Giedion, at once threatened and captivated by mechanization, urged a reassertion of human feeling and values.

For all three, ultimate salvation appeared to lie in a new approach to a fundamental split that had arisen in Western thought. Since the seventeenth century the trend in biology had been to reduce living organisms to mechanisms; Usher, Mumford, and Giedion all wanted to work in the opposite direction and raise our conception of mechanisms as organisms or as parts of a larger organism. Perhaps the "true" relationship of mechanism and organism can never be finally plumbed. Nevertheless, the approach suggested by Usher, Mumford, and Giedion encouraged a new way of thinking about technology, as an essentially human phenomenon rather than as an independent process divorced from human vitality and concerns. And it opened up a new way of thinking about history itself—with technology at the heart of the mystery. ■

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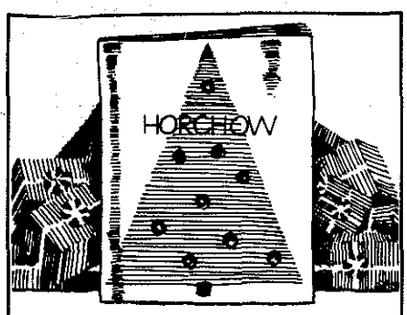
Arthur Molella is chairman of the Department of the History of Science and Technology at the National Museum of American History. He is working on a book about the origins of the history of technology as a field of study in the United States.



U.S. PATENT 252,112. JAN. 10, 1882.

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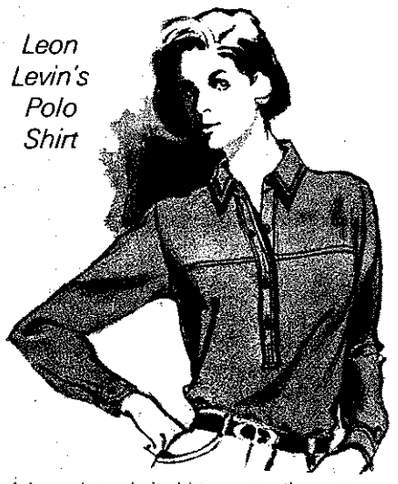

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# *Phenomena, comment and notes*



Part of farm machine abandoned as unfixable is routine challenge for Willie.

*A sociologist finds a living definition of workmanship in a man who keeps things running beyond their time*

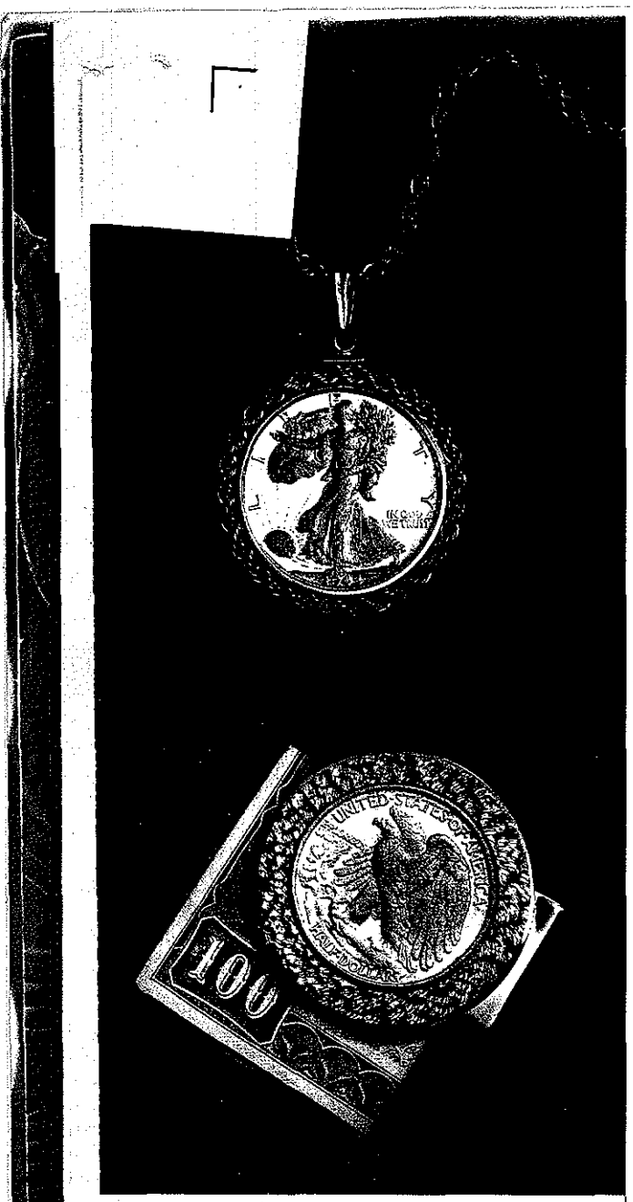
When we talk about science stories around here, we normally mean "hard" science—physics and astronomy, molecular biology, stories that involve a mechanical universe and plenty of photogenic hardware. Occasionally we will slip over the line into anthropology, even into contemporary urban anthropology, but never as far as sociology. This stance is partly a matter of ignorance, but also, in my case, prejudice. The one college course I took seemed to consist mostly of arbitrary definitions, generalizations and incredibly arcane ways of stating the obvious.

A recent issue of *Scientific American* unsettled my complacency. There was MIT physicist Philip Morrison favorably reviewing a sociologist's study of a repair shop in upstate New York. The book is *Working Knowledge: Skill and Community in a Small Shop*, published by the University of Chicago Press. The author is Douglas Harper, an associate professor of sociology at the State University of New York College at Potsdam. The hero is a man named Willie, a mechanic who embodies the very ideal of Robert Pirsig's *Zen and the Art of Motorcycle Maintenance*, a man whose skills span 2,500 years of human history. The irony is that this man can exist only in a region of grinding poverty, outside our consumer society.

In a special way, the author is a neighbor of the hero. As he points out, "It is not enough to live within ten or fifteen miles; to be neighbor to Willie you have to behave in a way that is routine in the shop but sometimes mysterious to outsiders. A person becomes a neighbor by passing informal tests, but you generally don't know what the tests are or whether you have passed until the time comes to ask for help. . . . An exorbitant offer of money or a promise to do better next time you have a chance to repay a favor will not bring Willie out on a cold night. When you ask for help the chips are cashed in. If you have paid your dues—if you are a *neighbor*—Willie will come, and he will stay until the problem is solved. For these jobs no money is exchanged. The most important work, ironically, is not sold but given."

Willie fixes Saabs, farm machinery, cedar-oil stills, well-drilling rigs, sawmill engines, plumbing, electrical systems, "machines and dwellings that are in ill repair, improvised and makeshift." The Saabs he usually works on are not the status symbols of today's young professionals but the older cars, "inexpensive and long-lasting, pragmatic and ugly; suited for rough roads and cold weather." When he needs a part he takes it from one of the wrecks outside the shop—or he makes it. He redesigns as he repairs: if the door handle on a particular model fails frequently, Willie designs and builds a different mechanism that will not.

It takes more thinking to fix something than it does to make it in a mass-production world, Harper argues. Makers are now machine tenders, turning out one small part in endless repeti-



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tion, knowing and needing to know almost nothing about the ultimate product. The repairer does need to understand the larger picture. Harper writes that even this distinction will fade, however. "In a typically rationalized repair, a mechanic removes a part of the machine thought to be defective and puts another in its place. Because automobiles are owned for fewer years, the work of replacing parts is not complicated by rusty bolts or deteriorated mounting brackets. It is a simple procedure, detailed in manuals. The defective parts are seldom repaired. In fact in many of the components (particularly the ignition systems) of modern cars, internal elements are sealed and impossible to fix."

Willie's understanding of metals goes back to 500 B.C., to the first blacksmiths who learned to work iron into weapons and implements. (Harper points out that although we customarily think of blacksmiths as farriers, horses were not shod until about A.D. 900.) Willie's father was a blacksmith who gradually moved into auto repair, and Willie's training began at the very beginning. He can still do a blacksmith's weld.

As Willie puts it: "In a manner of speaking the blacksmith was a machinist. Everything was molded and drilled. When it came to farm machinery, when you had a broken part . . . you'd get your metals to a certain temperature and then put the two pieces together and hammer them. You'd hammer them right back into one piece."

Harper compares Willie favorably with a type of person found in primitive societies whom Claude Lévi-Strauss called a *bricoleur*, a person who makes use of "odds and ends, the bits left over, the set of unrelated or oddly related objects." Above all, according to Lévi-Strauss, such a person thinks through a task: "Consider him at work and excited by his project. His first practical step is retrospective. He has to turn back to an already existent set made up of tools and materials, to consider or reconsider what it contains and, above all, to engage in a sort of dialogue with it, and before choosing between them, to index the possible answers which the whole set can offer to his problem . . . .

"The rules of his game are always to make do with 'whatever is at hand,' that is to say with a set of tools and materials which is always finite and is also heterogeneous because what it con-





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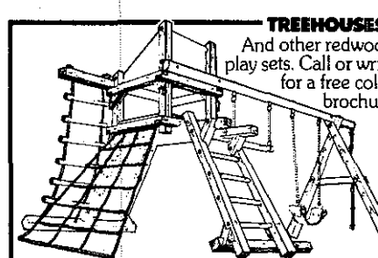

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tains bears no relation to the current projects or indeed to any particular project, but it is the contingent result of all the occasions there have been to renew or enrich the stock or to maintain it with the remains of previous constructions or destructions. . . ."

Why does Willie keep on, using scraps no one else wants to fix things no one else will work on? He is most certainly not getting rich. Relations with his customers can be complicated and unpleasant. He is frequently in pain from an injury incurred while working on the St. Lawrence Seaway (he could collect disability but does not—he would rather be working). Harper thinks the essential element is neither Willie's knowledge nor the responsibility of being able to keep so many farmers and other neighbors going. Instead, Harper contends, it is what Thorstein Veblen called the instinct of workmanship—to "seek realization and expression in an unfolding activity." As Veblen put it: "The instinct [of workmanship] may be in some sense . . . concerned with the ways and means of life rather than with any one given ulterior end. It has essentially to do with proximate rather than ulterior ends. . . . Efficient use of the means at hand and adequate management of the resources available for the purpose of life is itself an end of endeavour, and accomplishment of this kind a source of gratification."

Whatever the grand theories, Willie goes on. He is installing an old gasoline-storage tank as part of a solar hot-water heating system, and a wind-powered generator with blades of his own design (cut from 55-gallon drums) that produce even pressure on the central shaft. His own Saab has begun its fourth hundred-thousand miles. But the de-skilling, the disabling that cause the worker alienation sociologists love to write about is catching up to Willie. The new cars are too complicated even for someone with his skills. And instead of keeping their old machinery running, farmers trade it in for new to receive the best depreciation allowances and investment credits.

Garages have always intimidated me because of my total mechanical inadequacy. Now a sociologist, of all people, has taken me inside and shown me what workmanship can mean. It's time for another look at sociology—and time to mourn the passing of the *bricoleur*.

*John P. Wiley jr.*

POSTFIX
BY JOHN O'ROURKE

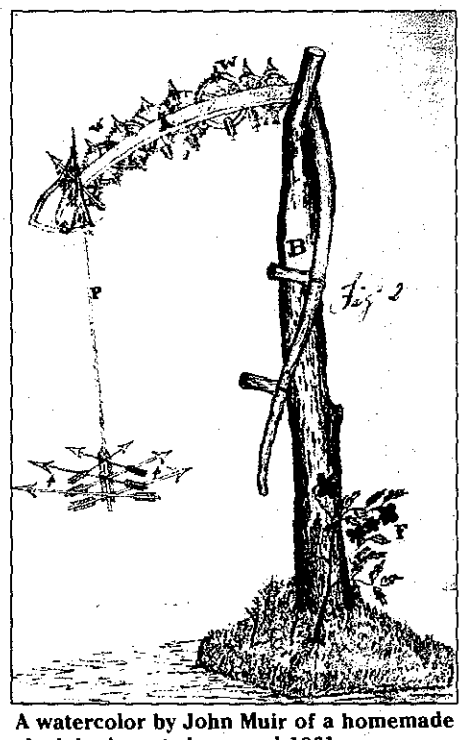
# Among the Works of God and Man

John Muir spent most of his life, as he put it, in "the study of the inventions of God." He was a world-renowned naturalist and conservationist, a respected botanist and glaciologist, and a writer who with words brought the wild areas he loved to millions. But before he took up his pursuit of untouched places, he first devoted himself to what might seem an opposite world: he was a tireless inventor and mechanic, a few of whose creations might have made him rich had he bothered to patent them.

Muir was born in Scotland on April 21, 1838, one hundred and fifty years ago this spring. He spent much of his childhood in backbreaking labor on his father's pioneer Wisconsin farm, to which the family emigrated when he was eleven. While in his teens he exhibited the tinkerer's spirit that was so invaluable on a frontier farm. His first real invention was a sort of self-setting model sawmill, workable but not particularly practical. There followed waterwheels, wooden clocks, barometers, and more.

In 1860 an admiring neighbor persuaded Muir to demonstrate his ingenuity at the Wisconsin State Agricultural Fair, in Madison. The judges there pronounced him "a genius in the best sense" and gave him a special award for his exhibit, which included two hickory clocks and an "early-rising machine" that tumbled the sleeper out of bed at a preset time. At the fair he was offered a job as apprentice to a Prairie du Chien man who was perfecting a Mississippi iceboat.

The boat never sailed, and Muir soon returned to Madison and got himself admitted on probation to the fledgling University of Wisconsin. His roommate later recalled that Muir kept "a strange-looking room for a college student . . . shelves, one above the other . . . were filled with retorts, glass tubes, glass jars, botanical and geological specimens and small mechanical contrivances. On the floor . . . were a number of machines of larger size, whose purposes were not apparent."



A watercolor by John Muir of a homemade clock he invented, around 1861.

There were no laboratory facilities at the university, so Muir built his own. He constructed, among other things, "a little device for measuring the growth of plants, so delicate that . . . one could see the hand move across the dial, measuring growth from hour to hour." He invented an automatic desk, which took a stack of books, delivered each one, turned its pages, and replaced it, all according to a set schedule.

Cheerful but restless—and wanting to avoid Civil War conscription—Muir left college to work at the mill and factory of two Scottish immigrants in Ontario. There he devised his most serious inventions yet, a self-feeding lathe and a machine to bore and drive teeth for the rakes the factory made. The plant's production doubled.

"Great God!" Muir later wrote. "There were times when I was haunted with inventions that tortured me waking or sleeping until I could give them visible form, something that could be seen and touched, something that worked. My mind and heart were both given to them." But he was torn between that urge and another: a desire to devote himself to botany. He had an almost mystical yearning to get into the world's untrammeled places.

He next went to work at an Indianapolis wagon-parts plant, where he amazed his employers not only with production-multiplying innovations but also with a pioneer time-and-motion study. The owners offered him a partnership, but it was too late. In March 1867 an accident at the factory temporarily blinded Muir. As his sight returned, he resolved to "bid adieu to mechanical inventions" and take up "the study of the inventions of God." He started by hiking a thousand miles to the Gulf of Mexico and traveling on to California.

"I could have become a millionaire," he crowed, "and I chose to become a tramp." He did once attempt to patent his early-rising bed, but that was all; he believed that "no inventor has the right to profit by an invention . . . really inspired by the Almighty."

In the succeeding years he became a powerful lobbyist in behalf of national parks and forests. He uncovered the origins of American glacial masses and identified the importance of trees as watersheds and soil protectors. In 1892 he founded the Sierra Club.

For him, all his conservationist activities strained toward the same ideal as his earlier technological work. He once wrote from Yosemite Valley, "I have this big, well-defined faith for humanity as workman, that the time is coming when every 'article of manufacture' will be as purely a work of God as are these waters and pine trees and bonnie loving flowers." ■

John O'Rourke, a retired professor of marketing, lives in Carmel, California, and writes free-lance.



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DEPARTMENTAL ORDERS

DELEGATIONS OF AUTHORITY

PTI - DOO 10-1

c. Sections 5, 6 and 11 of the Stevenson-Wydler Technology Innovation Act of 1980 (P.L. 96-480) relating to studies of technological development in the United States, cooperative technology arrangements, and the transfer of industrial technology from the Federal Government to the private sector.

d. Section 18 of the Office of Management and Budget Circular A-124, dated February 19, 1982, issued pursuant to P.L. 96-517, assigning to the Department lead agency responsibility with respect to the implementation of Federal patent policy.

PTO - DOO 30-3 A

b. The functions in Executive Order 10096 (except section 5) and Executive Order 10930, insofar as these functions relate to determining the ownership of patents and rights to inventions made by Government employees;

NTIS - DOO 30-7 A

b. Executive Order 9865, as amended by Section 5 of Executive Order 10096 and by Executive Order 10930, to the extent that this authority is not reserved to the Assistant Secretary for Science and Technology in Department Organization Order 10-1.

NOTE - ALL 3 CONTAIN A PROVISION LIKE

e. Such functions under other authorities of the Secretary of Commerce as are applicable to performing the functions assigned in this Order.

FUNCTIONS

PTI - DOO 10-1

d. Identify and analyze barriers to productivity improvement and technological growth in the U.S. economy, and provide leadership and assistance in developing policies and programs designed to foster greater private sector use of productivity measurement and improvement techniques, enhance the flow of Federally funded technologies to the private sector, and facilitate cooperative research and development arrangements;

f. Perform lead agency functions concerning Federal patent policy, including coordinating, monitoring, gathering relevant data, evaluating relevant programs and activities, developing uniform Government-wide standards for implementation of Federal patent policy, preparing reports, disseminating information, making recommendations, and taking other actions necessary to assure maximum private sector opportunity for commercializing inventions resulting from projects financed with Federal government funds.

PTO - DOO 30-3 A

.03 Decide the ownership of patents and the rights to inventions made by Government employees, as provided by Executive Orders 10096 and 10930.

NTIS - DOO 30-7 A

h. File patent applications and obtain patents thereon in foreign countries for inventions owned by the United States of America and in the custody of the Secretary of Commerce and issue licenses under the foreign applications and patents;

i. Issue domestic licenses on patent applications and patents assigned to the United States of America and in the custody of the Secretary of Commerce; and

j. Provide liaison and coordination with the Committee on Government Patent Policy of the Federal Council for Science and Technology, furnish executive secretariat support to the Committee, advise the Assistant Secretary for Science and Technology on Committee matters, and assist in the development and formulation of a uniform Government-wide patent policy.

JAN 12 1982

MEMORANDUM FOR: HONORABLE MALCOLM BALDRIDGE
SECRETARY OF COMMERCE

FROM: DAVID A. STOCKMAN D. A. S.
DIRECTOR

SUBJECT: Assignment of Lead Agency for Implementation of P.L. 96-517

As you may know, we will soon issue a new OMB Circular which provides uniform implementing guidance for the Government patent policy section of Public Law 96-517, "The Patent and Trademark Amendments of 1980." This Act gives nonprofit organizations and small businesses a first right of refusal to title in inventions they have made in performance of Government grants and contracts. The Act takes precedent over approximately 26 conflicting statutory and administrative policies.

Since the Act is a fundamental change in the more traditional policy of Government ownership to inventions made with its support, we believe it is essential that a lead agency be designated to review agency implementing regulations; disseminate and collect information; monitor administrative or compliance measures; evaluate the Act's implementation; and recommend appropriate changes to OMB/OFPP. (A more detailed list of proposed lead agency functions and staffing is provided in Attachment A.)

The Department of Commerce seems the natural choice for assignment of this new lead agency function due to its prior experience and wide ranging interest in technology transfer, productivity, innovation and Government patent policy. In order to take full advantage of Commerce's experience and to support the expansion of the concept of P.L. 96-517 to all recipients of Federal research and development funding, the proposed functions include authority to collect information and recommend policy and regulatory changes that affect recipients beyond those covered by the Act.

I hope you will accept the responsibility for the lead agency which we believe will be challenging and rewarding. I would appreciate your designating an official to work with my staff in developing the details necessary to assure smooth implementation of the Circular and the lead agency.

I have designated Don Sowle, the Administrator of the Office of Federal Procurement Policy as my staff focal point, who has responsibilitiy for issuing patent policy regulations implementing P.L. 96-517.