DOCUMENT RESUME

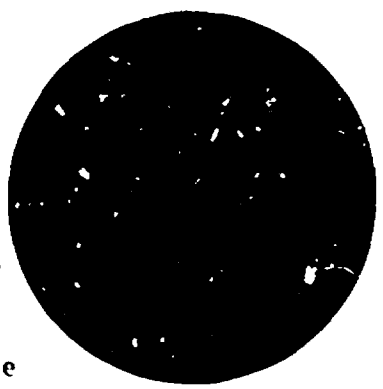
ED 042 606 SE 008 868

AUTHOR Brainard, Robert W., Ed.
TITLE Science Policy Bulletin, Volume 3 Number 1.
INSTITUTION Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
PUB DATE Feb 70
NOTE 71p.

EDRS PRICE EDRS Price MF-$0.50 HC-$3.65
DESCRIPTORS *Annotated Bibliographies, Federal Legislation, Financial Support, Foreign Policy, *Government Role, Natural Resources, *Policy Formation, *Scientific Research, Socioeconomic Influences, *Technology

ABSTRACT

This bimonthly bulletin reports annotations of current literature on science and public policy. Coverage includes both "policy for science" and "science for policy" in the areas of engineering, technical and narrowly specialized publications. Its purpose is to aid persons who study, formulate, or implement public policy related to science by alerting them to new additions to the science policy literature. Documents are listed under the headings of (1) General, (2) Science, Domestic Problems and National Goals, (3) Needs and Allocation of Resources for Science, (4) National R & D Programs, (5) Science, Education, and the University, (6) Science Management and Policy-Making Bodies, (7) Science, Foreign Affairs, and National Defense, and (8) International Science Policy. The 127 documents are listed under one of these categories. Cross-indexing is not used. Major meetings and other events in the area are also reported. (RR)



Battelle Memorial Institute

Science Policy Bulletin

Volume 3 · Number 1 · February 1970

The Bulletin reports the current national and international literature in the area of science and public policy, encompassing both "policy for science" and "science for policy" matters. For brevity, "science" is used to denote engineering, technology, and science.

The Bulletin is intended for individuals and organizations engaged in studying, formulating, or implementing public policy relating to science and its applications. The purpose of the Bulletin is to alert and inform those engaged in such activities of new additions to the science policy literature.

The literature reported by the Bulletin includes books, reports, periodical articles (see back cover for a listing of the regularly screened periodicals), as well as fugitive material. The focus of the literature reported is on matters of broad public policy; literature of a highly technical and narrowly specialized nature is not included.

The information presented by the Bulletin consists principally of precis that briefly summarize the content of the cited literature. The precis are presented under one of a number of topical categories; cross-indexing is not used.

TABLE OF CONTENTS

Science Policy Bulletin

Volume 3 • Number 1 • February 1970

Editor, Robert W. Brainard

The Bulletin is a bimonthly publication of Battelle Memorial Institute. The contribution of information to the Bulletin as well as suggestions and comments on its content and coverage are welcomed. Please address all correspondence to: The Editor, Science Policy Bulletin, Battelle Memorial Institute, 505 King Avenue, Columbus, Ohio, 43201.

1000 GENERAL

1001. Weinberg, A. M., "In Defense of Science", *Science*, v. 167, no. 3915, 9 January, 1970, pp. 141-145. The current attacks against science and technology are examined and a defense against these attacks is presented. The attacks come from four fronts: "scientific muckrakers ... who picture the scientific enterprise as being corrupted by political maneuvering"; those "who see a waning in the relevance of science to the public interest"; critics who are concerned with the "detrimental side effects" of technology; and "scientific abolitionists ... who consider the whole scientific-technological, if not rationalistic, mode ... a catastrophe". In response to the first attack, Weinberg acknowledges the role of politics in science, but suggests that the "muckrakers" fail "to recognize the degree to which the politics of science is sanitized and legitimated both by the intellectual market-place and by the budding axiology of science". As for the issue of relevance, many social problems "possess important technological components" and are amenable to "technological fixes"; "national socio-technological institutes" are proposed as a mechanism for enhancing the relevance of science and technology. In respect to the technology critics, Weinberg calls for new technology or improvement of the old to reduce or eliminate harmful side effects, and to the abolitionists he warns that it would be "the height of irrationality to turn our backs" on all that science and technology offers. "For rationality and science there is no simple or cheap substitute."

1002. Laswell, H. D., "Must Science Serve Political Power?", *American Psychologist*, v. 25, no. 2, February 1970, pp. 117-123. The "historic subordination" of science to "the institutions of war and oligarchy" is discussed and means for transforming the role of science to better serve the "commonwealth" are suggested. The author argues that "the scientific revolution has failed to revolutionize the basic structure of world politics" and that "knowledge is more commonly used for the relative benefit of the few than for the benefit of all". This is partially attributed to the "parochial environments" into which scientific knowledge is introduced and to the nature of the present "knowledge institutions" themselves. These factors have made science "a potential scapegoat for whatever disenchantment there may be with the earlier promises of a science-based technology". After offering several proposals for transforming the role of science, the author concludes that science "need not serve political power in the future" as it has in the past. "It is possible ... to overcome the parochialisms of perspective that have restricted the universalization of science and laid scientists open to the charge of giving disproportionate service to militancy and oligarchy."

1003. "Non-scientists Dissect Science", *Impact of Science on Society*, v. XIX, no. 4, Unesco, October-December 1969, pp. 305-404. This issue contains the views, largely critical, of nonscientists on science and technology and their effects on society. Concerns expressed include the dehumanizing effects of science, the deleterious side effects produced by science and technology, the relationship between scientists and political issues, and the setting of priorities (space exploration versus solution of social problems). The articles and their authors, all nonscientists, include: "Flawed Science, Damaged Human Life", by Robert Graves; "Technology in the Development of Africa – A Critique", by Thomas J. Mboya; "The Challenge of the Technological Revolution", by Edmund S. Muskie; "The Creative Spirit in Art and Science", by Joan Miro; "A Dream of Waters Glittering with Stars", by Miguel Angel Asturias; "The Good and Bad of Science and Technology", by Geronima T. Pecson; "A Poet's View of Science", by Pierre Emmanuel; "The Limitations of Natural Science", by Charles Habib Malik; "Science, Morality and the Humanities", by Sergei Gerasimov; and "The Frustrations of Science and Technology", by Mochtar Lubis. A forthcoming issue of *Impact* [vol. XX (1970), no. 2], entitled "How Scientists View Science", will be devoted to a reply by scientists to the views expressed in this issue.

1004. Eckman, P. K. (ed.), "Technology and Social Progress – Synergism or Conflict?", Proceedings of the Sixth American Astronautical Society Goddard Memorial Symposium held March 12-13, 1968, AAS Science and Technology Series, 1969, 158 pp. ($9.75). "The basic objective of the . . . Symposium was to examine the effect of technology upon human progress. Within this broad context, a specific objective was to evaluate the contribution of the space program as a particular manifestation of technological innovation in modern society." The papers presented include "Technology of Social Progress", by Cong. J. E. Karth; "The Dimensions of Progress in Historical Perspective", by Arnold Kramish; "Big Technology, The Technology Gap, and a Dangerous Policy Pitfall", by R. R. Nelson; "Direct and Indirect Effects of Large Technology Programs", by L. S. Silk; "Long Term Impacts of Big Technology", by M. L. Weidenbaum; "Space as an Innovative Technology", by D. J. Fink; "National Programs and the Progress of Technological Societies", by T. J. Gordon and A. L. Shef; and "The European Outlook", by L. G. Napolitano. (For sale by the Publications Office, American Astronautical Society, P.O. Box 746, [illegible] California 91356.)

1005. Caldet. N., "Technopolis: Soci[illegible] Conse[illegible] of the Uses of Science", London: MacGibbon & Kee, 1969, 381 pp. (£ 2.25). The author analyzes and discusses the principal technological dangers of our time and warns of problems in the present relations between science and the uses that society puts it to. Part I introduces the general theme

of the book – how can science "be made subject to the desires of ordinary people?" – identifies "some general and particular political issues of *our* scientific age", and discusses "ways of reconciling long-range planning with democratic debate". Part II "traces political roots and branches of some current modes of science policymaking and of scientific advice in government". Part III deals with "current and foreseeable opportunities and fears that arise from the uses of science and technology. They represent the unfamiliar questions with which politicians and public have to deal increasingly, and for which conventional political ideas give inadequate guidance". Part IV concerns the social control of the uses of science, with emphasis on the problem of "reconciling specialist expertise and long-range planning with the generalism of democracy. It must be done in such a way that the wishes of the ordinary citizen are heeded and the experts neither dictate nor bow to administrative government. The only solution is to bring experts and the public face to face in continuous debate about goals".

1006. Goodman, P., "The Trouble with Today's Technology: A Social Critic's View", *Innovation*, no. 2, June 1969, pp. 38-47. The "entire relationship of science, technology, and social needs" must be altered; this "will certainly involve radical changes in scientific education, in the organization of science, and in the kinds of men who make scientific decisions". Goodman reviews and analyzes the current criticisms of science and technology and suggests modifications to bring the latter in line with personal and social needs. "Science and technology", he suggests, "have come to seem to many . . . as necessarily inhuman, abstract, and regimenting, necessarily hand in glove with power, and even diabolical". As for changes, Goodman calls for the elevation of technology (which is now "half tied to the theoretical sciences and half treated as mere know-how for political and commercial purposes") to a responsible learned profession, for its simplification, and for its employment in an ecologically wise manner. Beyond this, R&D "ought to be widely decentralized, the national fund being distributed through thousands of centers of initiative and decision".

1007. "The AIAA President's Forum on Science, Technology, and the Quality of Life", reprinted from *Astronautics & Aeronautics*, February 1970, 54 pp. This report is a transcript of a forum entitled "Science, Technology, and the Quality of Life", sponsored by the American Institute of Aeronautics and Astronautics, that focused on the application of science and technology to social problems. The keynote speaker, Jonas Salk, emphasizes that we have entered a new epoch in which "man is conscious of the possibility of death of his species and of his own power to cause this"; he suggests that we must develop a new value system for our time. Constantinos

Doxiadis, noted city planner, analyzes the way man has settled on earth and calls upon science and technology to solve the resulting environmental and social problems. Fernando De Mendonca, Scientific Director for Brazil's National Space Commission, discusses the role of education in improving the quality of life and suggests some ways in which technology can be used for upgrading education. Ronald Nairn, president of Prescott College in Arizona, discusses some aspects of technology that bear on man's freedom of choice. Russell Train, Undersecretary of the Interior, emphasizes the importance of obtaining information concerning resources and environment before deciding what to do with regard to a given problem. Harvey Wheeler, of the Center for the Study of Democratic Institutions, discusses the "new politics of ecology" and its implications for the present party and legislative system. The subsequent discussion among the panel members is included.

1008. Dupree, A. H., "A New Rationale for Science", *Saturday Review*, v. 53, no. 6, 7 February 1970, pp. 55-57. The problem of federal science organization is considered from an historical perspective and suggestions are offered for modifying current science policy and organization. After reviewing policy and organizational developments in science since WWII, the author cites several new exigencies that point up the need for change: (1) the rise of the new left and its criticism of the military-industrial complex; (2) the "beginning of the realization" of an international scientific community; (3) the expansion of the social sciences; and (4) the "complete confusion" regarding "the place of the military in American life". "No more important problem faces the science policy machinery . . . than a reappraisal of the line between military- and civilian-supported research, and a movement of many scientific activities now supported by the Department of Defense." Beyond this, there is a need for "a comprehensive rationale by which the government can continue to support free science in the universities and wherever else it can find an institutional home". This new rationale must (1) "emphasize the connections . . . between long-range basic research and ap[illegible] science generally, in the interest of national security and of alleviation of social . . . problems"; (2) "take into account the humanities and social sciences as well as the physical and biological sciences"; (3) "recognize the connection of research and education in all fields"; and (4) "not be utterly dependent on universities for performance of research".

1009. Bretina, D. W., "Wanted: A Science Policy Doctrine", *Scientific Research*, v. 4, no. 26, 22 December 1969, pp. 22-24. This article discusses the inadequacy of present institutional arrangements for allocating funds for research, the disenhantment with science and technology, and the need for a science policy doctrine. The author

maintains that "many of the root causes of the growing crisis in science can be found in the Congress" as indicated by "the interactions of an apathetic Congress, a politically naive scientific community . . ., and an executive branch whose scientific leadership has tenuous ties at best to the centers of government power". "[I]nstitutional misalignments abound in the science establishment and in the Congress [because of the] science policy assumptions from which institutions derive their legitimacy . . .". ". . . [t]he past assumptions that undergird the superstructure of our science policy were forged in a wartime and cold war environment [that] does not fit into the present context." What is needed, says the author, is "a science policy doctrine" that provides the "strategy and philosophy" behind this field of public policy. To develop such a doctrine will require that science policy debates "be elevated to the level of sophistication of the debates over foreign and economic policy. Without more visibility for science policy and a sharper focus on . . . issues, doctrine cannot be forged".

1010. Lambright, W. H., "Public Administration and Science and Technology", N70-12675, *Working Paper No. 1*, Syracuse University, September 1969, 28 pp. The government-science relationship in the U.S. is reviewed and three major problem areas (basic research, science policy, and the application of science to social problems) are discussed. "The old basis upon which government-science relationship has been forged . . . is in transition" and the search is on for new foundations; the nature and causes of the transition are described. The place of basic research "in a government of mission-oriented agencies" is traced from WWII through the pluralistic system of support to the present efforts to establish a Department of Science. The need for a "truly national perspective on science policy", and the problems and obstacles to realizing such a perspective, are reviewed. At present, "the push and pulls of subsystem politics overwhelm all other influences, determining priority decisions almost by accident". Finally, the author calls for a shift in R&D priorities from their "cold war orientations" to contemporary social problems, and notes that the "scientific community cannot afford to stand aloof" from this shift. (For sale by the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151. Price: $3.00.)

1011. Weis, E., and Dutton, G., "A Checklist of Books", *Survey III for The Study of Science in Human Affairs, ISHA Bulletin No. 4/1969*, The Institute for the Study of Science in Human Affairs, August 1969, 149 pp. The checklist is an alphabetical listing of 1040 books, with full bibliographic information, emphasizing aspects of modern science or technology "in some relation to human affairs". The books also are listed in short form under the following topical headings:

Science Affairs in the United States, Science Affairs Abroad, Science and World Conflict, Science and World Development, Social Affairs as Affected by Science and Technology, Impact of Science-based Technologies, Historical Analysis of Science in Human Affairs, Humanities of Science, and Approaches to the Future. (This report can be obtained from The Institute for the Study of Science in Human Affairs, Columbia University, New York, N.Y. 10027.)

1012. Weis, E., and Kulkosky, P., "A Guide to Serial Publications Reporting on Science Affairs", Survey II for The Study of Science in Human Affairs, ISHA Bulletin No. 6/1969, The Institute for the Study of Science in Human Affairs, November 1969, 52 pp. The guide contains a list of 134 publications concerned with the study of science in human affairs. "Most of the periodicals deal with the ongoing interactions between scientific or technical activities and some major area of social concern." Entries include complete bibliographic information and an annotation for each periodical that describe the scope and topical content of the publication. Also included is an index by subject with topic headings such as Astronautics and Aeronautics, Biological Sciences and Medicine, Computers and Computer Technology, Environment and Resources, Government Activities and Policies, International and Foreign Affairs, and Public Understanding of Science. (This report can be obtained from The Institute for the Study of Science in Human Affairs, Columbia University, New York, N.Y. 10027.)

2000 SCIENCE, DOMESTIC PROBLEMS AND NATIONAL GOALS

2001. "Nixon Plans Massive Attack on Pollution", *Chemical & Engineering News*, v. 48, no. 5, 2 February 1970, pp. 24-25. The major elements of President Nixon's environmental-quality program are described and some reactions to them are presented. "President Nixon has promised the most comprehensive and costly program in the nation's history to clean up the environment." The program includes "spending $10 billion to clean up the nation's waters, intensified research on pollution from autos, and 'comprehensive new regulations' ". "Effluent charges on industries that dump wastes into ... streams, user taxes, more research on pollution, tightened standards on auto and industrial emission, and passing on to the consumer some of the costs of producing and disposing of goods without damage to the environment are some of the proposals." Sen. Edmund S. Muskie "called the President's $10 billion program to build waste treatment facilities 'inadequate' and went on to propose a 50-point program of legislative and financial commitments to solve environmental problems". "We must require stricter standards, faster timetables, tougher enforcement, and greater public participation. And we must spend much more money." In addition, Sen. Gaylord Nelson has proposed a comprehensive "environmental agenda for the seventies" which calls for phasing out the internal combustion auto engine by 1978, elimination of toxic pesticides by 1972, strict anti-pollution standards on detergents, and reduction of pollution from jet aircraft.

2002. Gruchow, N., "Environmental Council Named", *Science*, v. 167, no. 3919, 6 February 1970, p. 851. "President Nixon has appointed Russell E. Train, Under Secretary of the Interior, as chairman of the new Council on Environmental Quality .... Named to the council were Robert Cahn, Pulitzer prize-winning reporter for the *Christian Science Monitor*, and Gordon J. F. MacDonald, vice-chancellor for research and graduate affairs at the University of California, Santa Barbara. The new Council on Environmental Quality was established by the National Environmental Policy Act of 1969." The Act "is intended to establish a policy of preserving and enhancing the environment and a council to further this policy". "Train spoke specifically of the group's top priorities in a briefing session after the President's announcement. The council, he said, must consider the needs for a national policy on population, better planning of land use, and technical breakthroughs to solve air pollution." "He said he favored setting target dates for the solution of specific environmental problems, similar to the target which was set and achieved for a manned landing on the moon, but he cautioned that cleaning up the environment was 'infinitely more complex' than a lunar landing."

2003. "Environmental Decade", *Bioscience*, v. 20, no. 1, 1 January 1970, p. 44. "A bipartisan group of Congressmen have called for the 1970's to be The Environmental Decade, and have pledged to work diligently to identify and overcome all that degrades our environment. Leader and instigator of the idea is Henry S. Reuss (D-Wis.), supported by John D. Dingell (D-Mich.), Gilbert Gude (R-Md.), Floyd V. Hicks (D-Wash.), Paul N. McCloskey, Jr. (R-Cal.), John E. Moss (D-Cal.), John P. Saylor (R-Pa.), Guy Vander Jagt (R.-Mich.), and Jim Wright (D-Tex.). The Congressmen expressed their dissatisfaction with such inequities as a budget of $123 million this year for the National Park Service, and one of $1.3 million for the Corps of Engineers. Over the next five years, they say, $30-50 billion is needed to deal with the water pollution problems of the nation, not the 'ridiculous' $214 million proposed for this year by both the Johnson and Nixon Administration. Several conservation organizations, including the Isaac Walton League and the National Wildlife Federation, have pledged their support."

2004. "Watchdog Agency", *Chemical and Engineering News*, v. 48, no. 1, 5 January 1970, p. 10. "Sen. Edmund S. Muskie's (D-Me.) call for an 'independent, watchdog agency' on the environment comes hard on the heels of Congressional action on a measure that would set up an advisory Council on Environmental Quality in the executive office of the President. The independent agency proposed by Sen. Muskie, in contrast, would have responsibility for developing and implementing federal environmental quality standards, supporting basic research on environmental problems and control techniques, and providing technical assistance to state and local agencies." "The proliferation and overlap of existing federal pollution control and abatement programs are 'intolerable'. Federal bureaus, divisions, and administrations housed in separate departments have neither the status nor the manpower to deal with the problems." "Sen. Muskie's bill would create an Office of Environmental Quality, which would mesh with the council as an integrated agency in the office of the President. The council would operate on a policy level, whereas the Office of Environmental Quality would operate on a staff level. The Office ... would also provide staff support to the President and his cabinet-level Environmental Quality Council."

2005. "Environmental Bill Signed", *BioScience*, v. 20, no. 2, 15 January 1970, p. 115. "President Nixon's first official act of 1970 was to sign the National Environmental Policy Act of 1969. In doing so, the President warned that the fight against environmental contamination is a 'now or never' task for the next decade. This nation's goal for the next 10 years, the President said, must be to restore the quality of the environment, which also means attacking the broad problems of population congestion, transportation, and the like." The bill "sets

national goals for environmental management, authorizes certain research and data gathering activities, and establishes in the Executive Office of the President a three-member Council of Environmental Advisors". "The President believes that the Act he has signed gives us adequate organization and a good statement of direction .... Mr. Nixon also promised to submit 'highly qualified' candidates for the Council to the Senate early in the next session of Congress."

2006. Carter, L. J., "Water Pollution: Control Program Lags as Nixon Promises Cleanup", *Science*, v. 167, no. 3917, 23 January 1970, pp. 360-361. "President Nixon has pledged to make environmental quality a priority objective of his Administration." This article describes some of the delays and obstacles connected with efforts to control water pollution. Present strategy for dealing with the water-pollution problem is contained in the Water Quality Act of 1965, which provides for the states to adopt and enforce water-quality standards, with federal help only if necessary. Although all 50 states now have water-quality standards, only 14 have standards that the Federal Water Pollution Control Administration has not found deficient. Other problems cited include the failure of many municipalities and industries to meet deadlines for designing treatment works and letting contracts, delays in construction of treatment facilities caused by difficulties in financing, delays in equipment delivery, and shortages of skilled labor. The federal administration, which has provided $800 million for this construction, feels that additional funds are needed in the form of grants or bonds, but these would only "add to the inflationary pressures which it is trying to combat". The dilemma seems to be "between more inflation on the one hand and more pollution on the other".

2007. "Clearing the Waters", *Science News*, v. 97, no. 7, 14 February 1970, p. 168. In his latest message to Congress on the subject of the environment, President Nixon "touched on both financing and enforcement. He detailed an Environmental Financing Authority to purchase municipal bonds for sewage treatment plants and interceptor sewers. According to the plan, the Federal Government will make up the difference between interest rates paid to the agency by the municipalities, and the rate paid by the agency in the commercial market". Mr. Nixon proposes more rigorous enforcement of water-pollution-control laws, and extension of federal jurisdiction to include intrastate waterways. "The President's proposal also calls for faster action against firms in violation of water pollution control laws, plus a range of air pollution proposals that rely mainly on existing law. Among them would be establishment of auto emission standards in 1973 and 1975, and uniform national air pollution emission standards for industrial plants." "The President is not proposing an array of new procedures; he is simply escalating the penalties." The President's

message "included a package of 23 legislative proposals and 14 measures to be taken by executive action. His program, he declared, is designed to 'rescue our national habitat' ".

2008. **"Pollution at Federal Facilities", *Science*, v. 167, no. 3921, 20 February 1970, p. 1104.** "Declaring that the federal government has become one of the nation's worst polluters, President Nixon has issued an Executive Order requiring federal facilities to conform with air and water quality standards established under federal law. The order establishes a $359-million program for achieving this objective, prohibits the transfer of these funds to other programs, requires that new facilities be pollution-free, and gives responsibility for enforcement of the order to the Secretaries of Interior and Health, Education, and Welfare."

2009. **"The Environment: A National Mission for the Seventies", *Fortune*, v. LXXXI, no. 2, February 1970, 200 pp.** This issue is devoted entirely to the subject of environment. In introducing the issue, the editors warn that "environmental reform is going to be harder to achieve than many of its advocates suggest" and recommend that "what the U.S. needs to work upon first are the political and other arrangements by which the environment might be protected and improved". The issue includes the following: statements by President Nixon and Senator Muskie, and articles entitled "How to Think about the Environment", "The Limited War on Water Pollution", "America's Everyday Dreariness", "Industry Starts the Big Cleanup", "What Business Thinks", "The Economics of Environmental Quality", "Cars and Cities on a Collision Course", "How Baltimore Tamed the Highway Monster", "Some Burning Questions about Combustion", "Downtown is Looking Up", "Pleasantness Made to Order", and "Conservationists at the Barricades".

2010. ***Institutions for Effective Management of the Environment*, Report of the Environmental Study Group to the Environmental Studies Board of the National Academy of Sciences, National Academy of Engineering, Part I, January 1970, 62 pp.** This report presents and discusses several major recommendations for a national program for management of the environment. The report, which was prepared as a background paper, is intended to "provide a basis on which the Board will make recommendations for effective approaches and institutional mechanisms for dealing with environmental problems". The recommendations examined include (1) establishment of a Board of Environmental Affairs within the Office of the President, (2) formation of a joint committee of the Congress for the informed discussion of environmental affairs, (3) establishment of a comprehensive federal program for monitoring the environment, (4) development of Environmental Quality Indices, including

transparency of the air, purity of the water, noise level, etc., (5) establishment of a National Laboratory for the Environmental Sciences to develop knowledge and techniques leading to effective management of the environment, (6) establishment of an Institute for Environmental Studies to do long-range planning and provide early warning on potential environmental threats, (7) development of a Junior Environmental Education Program at the secondary-school level, (8) creation of multidisciplinary programs of environmental studies at the university level, and (9) establishment of a National Environmental Coalition to facilitate public education concerning environmental problems. (This report can be obtained from Mr. Charles Reed, The Environmental Studies Board, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)

2011. **Sayre, W. S., and Smith, B.L.R., "Government, Technology, and Social Problems", The Institute for the Study of Science in Human Affairs, Columbia University, 1969, 33 pp.** The prospects and problems of applying science and technology to the solution of social problems are discussed and assessed. The article starts by noting differences between the use of technology in defense/space and in the civilian domain. Following this, the authors introduce the concept of "readiness" as a means for identifying "a spectrum of social problems ranging from those that are ready for a technological 'quick fix' (i.e., politically amenable and within the state-of-the-art technically) all the way to those problems that are intransigent in both political and technological terms". Using this matrix, specific problem areas (e.g., auto safety, air pollution, weather modification, and riot control) are discussed in terms of their "readiness" for political/technical solution. From their analysis, the authors conclude that "technology seems suited to meeting public needs only when the technology is well in hand, and when ... common ... expectations exist on a politically acceptable course of action, and when the relevant bureaucracies are sensitive to the contribution of technology". They add that scientists "could perhaps find no better way to protect the future of their enterprise than by demonstrating its relevance to the great concerns of twentieth century urban America". (This report can be obtained from The Institute for the Study of Science in Human Affairs, Columbia University, New York, New York 10027.)

2012. "Technology vs. Crime: Plans Released", *Washington Science Trends*, v. XXIII, no. 14, 12 January 1970, pp. 79-81. "The National Institute of Law Enforcement and Criminal Justice ... released a program and project plan for Fiscal Year 1970 which outlines priority areas for research and development grants and contracts. The Institute has allocated $7.5 million to research and development projects, with 25-30% expected to be used for the development of police hardware." The Institute's five priority areas for R&D are:

"stranger-to-stranger street crime, particularly robbery, assault and vandalism in the cities; burglary, particularly in the home and small business establishment; control of the narcotics addict and the traffic in narcotics; those kinds of violent disorder which prevent a necessary level of orderly functioning within our communities and our major social and government institutions; organized crime, particularly those aspects that foster violence, drug addiction, corruption and loss of confidence in government processes". With regard to apprehension of offenders, the 1970 research program includes projects in the areas of new equipment, improved communications, improved identification procedures, and improved police-patrol practice. Other projects will be conducted to "explore various methods for making a crime more difficult to commit and increasing the potential offender's perception of possible failure or apprehension".

2013. "Science, Technology in State Governments To Be Aided by NSF Grant", National Science Foundation, News Release NSF 70-114, February 16, 1970, 3 pp. The Council of State Governments has been awarded a $320,000 grant by the National Science Foundation to assist the states in organizing and using science and technology. The Council "is a joint agency of all States organized for the purpose of strengthening State government and preserving its role in the Federal system". The purposes of the project are to determine how effectively States now use science and technology; find out how the States might better use science and technology; identify State problems that might have technological solutions, and outline alternative approaches to these solutions; and to suggest and test the procedures whereby States can make better use of technological knowledge. The project "will give particular attention to how well R&D information gets into State decision-making processes, and to ways that the Federal government might better transfer scientific and technological information to State government agencies". Scientific and technical guidance for the project "will be provided by an advisory committee that will represent all branches of State government, the Federal government, scientific organizations, and academic institutions".

2014. 'Report of the New York State Science and Technology Foundation", State of New York, Science and Technology Foundation, 1969, 20 pp. This report summarizes the projects supported by Foundation grants for the years 1965-69, and includes charts showing the distribution of Foundation grants by purpose, by type of grantee institution (public or private), and by geographical area within the state. The Report of the Treasurer, the Foundation balance sheet for 1969, is included. The types of projects supported by the New York State Science and Technology Foundation are: (1) those which "present the greatest opportunity to build higher peaks of excellence in the teaching of the sciences", (2) those "intended to strengthen

the teaching of engineering subjects", (3) those which promise "results relevant to the progress of industries important in the economy of New York State", and (4) those which are "directed toward the solution of statewise environmental problems". Appendix A summarizes the Foundation-supported projects for each university and Appendix B lists the publications resulting from projects financed by the Foundation. (This report can be obtained from Donald H. Davenport, New York State Science and Technology Foundation, 112 State Street, Albany, N.Y. 12207.)

2015. **"Senate to Probe Technology Transfer"**, *Washington Science Trends*, v. XXIII, no. 16, 26 January 1970, p. 92. "A Senate Subcommittee will hold hearings next month to investigate the 'alleged standstill' in programs to transfer military and space technology to business, industry and local government. The plans were announced by Sen. Jennings Randolph (D-W. Va.), who said there needs to be a 'national commitment and a systematic program' for further application of research and development. Although much has been said about such programs in recent years, 'transfer' efforts have been vastly scaled down. Congress has refused to fund the State Technology Services program; the Atomic Energy Commission has quietly closed down its 'industrial cooperation' offices; and the space agency's efforts, though heavily funded, have had little or no impact." The hearings will be held by the Subcommittee on Science and Technology, Select Committee on Small Business.

2016. **Sovel, M. T., "Technology Transfer – A Selected Bibliography", N69-28868, Denver University, June 1969, 101 pp.** This bibliography is "the initial attempt at compiling a comprehensive listing on the subject of technology transfer". ("*Technology* is considered here to be technical information, including scientific knowledge, making possible the conception, development, design, production, and distribution of goods and services. *Transfer* here means the effective communciation of such information from one person or source to a recipient who accepts it for consideration and possible application.") "The bibliography is further concerned with information which leads to a greater understanding of the factors affecting the transfer process, namely, the barriers and incentives to the process." The 428 listings of the bibliography encompasses literature on both intranational and international aspects of technology transfer. The bibliography is arranged in three sections: an alphabetical listing, an author index, and a "key-word-in-context" index. (For sale by the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151. Price: $3.00.)

3000 NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE

3001. Fisher, W. H., and Lederman, L. L., "Probable Levels of R&D Expenditures in 1970 – Forecast and Analysis", Report from Columbus Laboratories, Battelle Memorial Institute, December 1969, 8 pp. Trends in R&D expenditures and prospects for the future are presented and analyzed. This report, the latest in Battelle's series of annual forecasts of R&D, presents an estimate of R&D activity for calendar year 1970 by source of funds and by performer, discusses factors affecting federal support, and describes the roles of industry and academic and other nonprofit institutions in R&D. For 1970, Battelle forecasts total R&D expenditures of $25.6 billion, with $15.0 billion from government, $9.4 billion from industry, and $1.3 billion from nonprofit sources; overall, this represents a rise of less than 1 percent above 1969. Government expenditures for R&D are expected to grow at an annual rate of 4 percent over the next decade, as compared with the compounded rate of 7 percent during the 1959-69 period. Among the factors discussed as affecting federal R&D support are the present fiscal pressures, the "controllable" nature of the federal R&D budget, the Vietnam war ("It is unlikely that R&D expenditures during 1970 will be much affected by peace in Vietnam"), the growing emphasis in support of social programs, and Congressional concern over the level of funding and value of R&D. In contrast to the slightly reduced federal funding, slight increases are expected by industry and academic and other nonprofit sources for 1970. (This report can be obtained from Battelle Memorial Institute, Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201.)

3002. Danilov, V. J., "$27-Billion for Research", *Industrial Research*, v. 12, no. 1, January 1970, pp. 46-49. R&D activities "are suffering from a depressed market in which government funding has plateaued, industrial expenditures have slowed down, and university research has been disrupted and sometimes cut back. The problem is compounded by increasing costs and inflation, which accounted for much of the 'growth' in the nation's R&D spending last year and will contribute substantially to anticipated 1970 expenditures". Despite strong statements of support for more R&D on pollution, mass transportation, health, and other areas, few new programs were launched in 1969 or are expected in 1970. This article outlines some of the setbacks suffered in 1969 by the research industry and presents the expenditures planned by various agencies and industries in 1970. Highlights of the plans include: R&D expenditures should exceed $27 billion in 1970, an increase of over $1 billion from 1969; more than 90 percent of the federal R&D will be supported by four agencies –

Department of Defense, NASA, Atomic Energy Commission, and the Department of Health, Education and Welfare; the federal government will finance at least $16.5 billion of the R&D, industry will support $9.2 billion, and the universities and other nonprofit organizations the remaining amount; 65 percent of the funds will be used for development, 23 percent for applied research, and 12 percent for basic research. Industrial R&D expenditures are expected to increase at a slower pace than during the last few years and again to be dominated by five industries: aircraft and missiles, electrical equipment and communications, chemicals and applied products, machinery, and motor vehicles and other transportation equipment.

3003. Boffey, P., Carter, L., and Hamilton, A., "Nixon Budget: Science Funding Remains Tight", *Science*, v. 167, no. 3919, 6 February 1970, pp. 845-848. "A continuing shortage of funds for science and a greater emphasis on using science to solve practical social problems are two of the main themes of President Nixon's proposed budget" for fiscal 1971. Of the total budget of $200.8 billion, 7.8 percent will finance R&D. "Obligations for the conduct of basic and applied research would increase by $260 million, from $5.54 billion to $5.80 billion." The President emphasized that for the first time in 20 years, more money will be spent on human-resource programs than on national defense. With regard to academic R&D, the National Science Foundation and the Department of Health, Education and Welfare will increase their support substantially, while the Defense Department, the Atomic Energy Commission, and the National Aeronautics and Space Administration will cut their university support. Highlights of the budget in the areas of environment, health, defense, and space are presented. The $1115 million budget for environment includes increases in spending for control of air and water pollution, for purchases of open space, parklands, and recreation areas, and for grants for sewage-treatment works. The $2235 million health budget shows increases in outlays for medical research, manpower training, construction of health facilities, and improved organization of the health delivery system. Allocation of the $71.8 billion for defense spending reflects a "'low profile' defense posture" which deemphasizes land forces and places greater reliance on sea power and strategic weapons such as the Safeguard antiballistic missile system. The dominant feature of the $3.4 billion space budget is the proposal to stretch out the seven remaining Apollo moon shots and terminate production of the Saturn V rocket.

3004. "Federal Budget Digest", *Washington Science Trends*, v. XXIII, no. 17-18, 2-9 February 1970, pp. 97-108. "The Nixon Administration presented Congress . . . with its first formal budget, carrying increased funds for research, less money for development and a major shift in emphasis away from military development and space

programs." The budget for Fiscal Year 1971 reflects "the new importance of R&D targeted to 'pressing social problems including those of the environment, education, housing, transportation and crime' ". " 'The 1971 budget', the President declared, 'initiates efforts to make more effective use of the Federal research and development dollar and to foster research more directly related to the understanding and solution of a broad range of national problems.' " "The new budget makes the initial 'down payment' on a wide variety of programs which... could mean vast increases for research and development funds in the latter half of the decade." This applies to such programs as air and water pollution control and to programs in space. Although inflation means the U.S. will buy less R&D in 1971 than in 1968, the allocation for science and technology "remains remarkably high for a period of intensive budgetary pressures". Total federal obligations are divided into the areas of research, development, facilities, and academic R&D. Information on funding and major programs is provided for the following areas: environmental quality, biomedical research and health services, NASA and other space programs, National Science Foundation, marine science programs, Departments of Defense, Commerce, Interior, Agriculture, Transportation, and the Atomic Energy Commission. (Additional reviews and assessments of the FY'71 R&D budget are presented in *Science News*, v. 97, no. 6, February 7, 1970; *Chemical & Engineering News*, v. 48, no. 6, February 9, 1970; and *Nature*, v. 225, no. 5233, February 14, 1970.)

3005. **"The Physical Sciences", National Science Board, National Science Foundation, 1970, 62 pp.** This, the second annual report of the National Science Board, warns that because of cuts in the federal research budget, the scientific effort of the U.S. "is currently threatened with possible mediocrity" and that U.S. leadership in science and technology "is being challenged not only by the Soviet Union but also by Western Europe and Japan". "[It] is clear there will be a day of reckoning for [U.S.] science and for the national well being... That day may be very near." The report describes "the present state of the physical sciences, their recent accomplishments, their apparent opportunities and challenges, and the requirements if these opportunities and challenges are to be accepted". The report begins with a brief summary and a list of 16 recommendations, including expansion of federal programs of institutional and departmental support for graduate education, increased research support for the National Science Foundation, acquisition and construction of new facilities and instrumentation, reversal of the present trend to decrease funding for the scientific aspects of the space program, and establishment of more effective ways for industry, government, and universities to cooperate in translating basic science into social utility. The main body of the report is broadly divided

into three chapters: State of the Physical Sciences, Nature of the Physical Sciences Enterprise, and Health of the United States Effort in the Physical Sciences. (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price: 50 cents.)

3006. **"DuBridge Discusses Basic Science"**, *Science*, **v. 167, no. 3917, 23 January 1970, p. 360.** In an address to the annual meeting of Sigma Xi in November 1969, Lee A. DuBridge, Science Advisor to the President, described the effects on R&D of pressures on the federal budget: "When the Nixon Administration assumed office in January 1969 it became evident that the balancing of the federal budget and the control of inflation was its most important task, next to renewed efforts to end the war in Vietnam. Nevertheless, the Nixon budget submitted to the Congress proposed that in spite of all these pressures the 1970 budget for *basic academic science* should be maintained at or slightly above its fiscal 1969 level. Unfortunately, the Congress appears not to agree with this proposal. Although most of the appropriations bills have not been finally passed, it is very clear that painful cuts in the Nixon science budget will be imposed. The Administration will try again in fiscal 1971, but the Congressional attitude is not particularly encouraging. The Congress seems even unwilling to adopt a tax bill which will maintain adequate federal revenues. Herein, of course, lies the basic issue. The members of the Congress presumably reflecting the opinions and interests, or lack thereof, of their constituents are apparently not convinced that the continued growth and virility of basic science in this country is essential to the national interest and to the national welfare. At the very least, they seem to be saying that, in times of budget restrictions, scientific research seems less urgent and more deferrable than other matters."

3007. **"Statement on FY 1971 Budget", National Science Foundation, News Release NSF 70-107, February 2, 1970, 12 pp.** This document presents the FY 1971 budget allocations for the National Science Foundation (NSF), with introductory remarks by NSF Director, W. D. McElroy. Overall, the budget request is for $511 million, as compared with an appropriation of $438 million in FY 1970. The budget is divided over several activities and areas, each of which is briefly described. These include "Support of Scientific Research" (project support, facilities and equipment, national and special research projects, and national research centers) for which $292.3 million is programmed; "Science Education Support" for which $96.9 million is requested; "Institutional Support for Science" with $55.5 million being proposed; and the smaller activities such as computing, the Sea Grant program, science information, planning and policy studies, and international cooperative activities. This budget, comments McElroy, "...will enable us to maintain a vigorous

although austere program of support for basic research and graduate education".

3008. **"Federal Funds for Research, Development, and Other Scientific Activities, Fiscal Years 1968, 1969, and 1970", v. XVIII, Surveys of Science Resources Series, NSF 69-31, National Science Foundation, August 1969, 280 pp.** This annual report presents data and information on the federal R&D expenditures for 1968-1970. Data are provided in terms of the departments and agencies that originate the R&D, the performers (e.g., industries, universities) to whom R&D work is assigned, the character of the effort, and the fields and disciplines receiving varying portions of support. Also included is a section on the geographic (state) distribution of federal R&D funds for 1968. Overall findings of the report include the following: federal obligations for R&D totaled $15.9 billion in fiscal year 1968 and are expected to be $15.8 billion in 1969 and $16.5 billion in 1970; obligations for basic research were $2.1 billion for 1968 and are expected to be the same in 1969 and increase to $2.4 billion in 1970; obligations for applied research totaled $3.3 billion in 1968 and are expected to be the same in 1969 and to increase to $3.7 billion in 1970. The Department of Defense, the National Aeronautics and Space Administration, and the Atomic Energy Commission provided 83 percent of the federal R&D funding in 1969; the other 29 federal R&D supporting agencies accounted for the remainder. The report also contains sections on funds for R&D plants, for activities connected with the collection and dissemination of scientific and technical information, and for the collection, analysis, and publication of general-purpose scientific data. (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price: $2.50.)

3009. **"Science and Engineering Doctorate Supply and Utilization, 1968-1980", National Science Foundation, NSF 69-37, November 1969, 33 pp.** This report summarizes the findings of a study of the expected future relationship between the supply and utilization of science and engineering doctorates. In January 1968, approximately 147,000 scientists and engineers were employed in the United States distributed as follows: three-fifths in universities and colleges, one-fourth in private industry, and one-eighth in government agencies and other organizations. By 1980 the projected number of science and engineering doctorates will be about 350,000. Methods used to arrive at the projections are described. The projected basic 1980 utilization of 275,000-300,000 reflects current utilization and is not "responsive to national needs for improvement". The modified, improved 1980 utilization of possibly 390,000 "illustrate[s] the number of Ph.D.'s utilized if recovery to funding growth rates were to occur or if quality and activity changes were to take place". Appendixes include

information on Sectoral Employment of Doctoral Scientists, Work Activities of Doctoral Scientists, Projected Availability of Science and Engineering Doctorates, Projected 1980 Utilization of Ph.D. Scientists and Engineers, and Possible Modifications of Utilization Patterns. (For sale from the U.S. Government Printing Office, Washington, D.C. 20402. Price: 50 cents.)

3010. "Engineering Demand Seen High Due to Backlog", *Washington Science Trends*, v. XXIII, no. 20, 23 February 1970, p. 117. "Engineering employment increased by 5% during 1968, but new engineers proved 'hard to find' and employers were able to recruit only 75 to 80% of the engineering graduates sought. These findings and other statistics on the demand for engineers and technicians are reported in a survey conducted by the Engineering Manpower Commission of the Engineers Joint Council. The survey showed that technician employment also increased about 3% in 1968, but graduate engineering technicians were the hardest for employers to recruit and hiring goals lagged about 20%. Survey statistics also pointed out technician employment 'cannot automatically be assumed to depend on engineering employment in the same industry'. An EMC analysis of these findings indicates 'a backlog of unfilled needs from previous years may serve as a cushion against major unemployment of engineers and technicians . . .'. The illustrated report also includes breakdowns by industry of how engineers and technicians are distributed according to curriculum and job function, ratios of technicians to engineers and separation rates according to reasons." (The report, "Demand for Engineers and Technicians – 1968", is available from the Engineers Joint Council, Department P, 345 E. 47th St., New York, N.Y. 10017. Price $5.00.)

4000 NATIONAL R&D PROGRAMS

4001. Rabinowitch, E., and Lewis, R. S., "Man on the Moon", New York and London: Basic Books, Inc., 1969, 204 pp. ($5.95.) This book consists of 16 essays that deal broadly with the impact of the U.S. space program upon science, technology, and international cooperation. The essays, which appeared in slightly different form in the Bulletin of the Atomic Scientists, cover such subtopics as the philosophical and social implications of Project Apollo, the space program in relation to other priority areas (e.g., housing, health, and pollution), the international political implications, the impact of the program on science and technology, and post-Apollo policy. Contributors to the volume include Sir Bernard Lovell, Freeman Dyson, Eugene Rabinowitch, Franklin A. Long, Harold C. Urey, and Wernher von Braun.

4002. Normyle, W. J., "NASA Budget Hits 7-Year Low", *Aviation Week & Space Technology*, v. 92, no. 5, 2 February 1970, pp. 16-18. The Nixon Administration requested the lowest authorized funding in 7 years for the National Aeronautics and Space Administration in Fiscal Year 1971 – obligational authority of $3.333 billion with planned expenditures of $3.403 billion. NASA was given permission to start on major design work for the space shuttle transportation system and the post-Apollo national space station, to increase efforts in aeronautical research, to develop an application of space technology to the broad area of ecology, and to continue plans for the Apollo Applications Program. After Apollo 13 is launched in April, NASA will launch the three-man spacecraft an average of once every 6 months instead of every 4 months as planned earlier. Completely eliminated in the 1971 budget was the sustaining university program in which NASA helped finance studies of doctoral candidates in science and technology. Details of specific increases and decreases in NASA's budget, as well as comparisons of the budgets for 1969, 1970, and 1971, are presented.

4003. Hamilton, A., "NASA: Stretching Out Space Program", *Science*, v. 167, no. 3917, 23 January 1970, p. 356. Cuts in funding for the National Aeronautics and Space Administration will mean that the manned lunar program, originally scheduled for eight more shots by the end of 1972, will be stretched out for 2 years, to 1974; the number of future unmanned planetary probes is being reduced; and only tentative steps are to be taken toward NASA's goal of a major post-Apollo program of manned space exploration. "The space budget cuts . . . may be a sign that Nixon seriously intends to reorder the government's spending priorities to concentrate on domestic, earth-bound problems." Priority within the space program will be given to

unmanned programs and the stretched-out Apollo project, with greater emphasis on scientific returns from space activity. There will be seven more manned lunar missions at 6-month intervals and one Saturn V rocket launching of a manned orbiting workshop. Presently planned manned spaceflights will end in 1974. Unmanned space activities include orbiting of Mars in 1971, a Jupiter probe in 1972, and a landing on Mars in 1975. As a result of the curtailed space program, employment will be reduced from 190,000 to 140,000 by 30 June 1971.

4004. "Manned Space Flight", *Space/Aeronautics*, v. 53, no. 1, January 1970, pp. 33-42. Plans and prospects for the national manned space flight programs are reviewed and discussed. Key projects covered in the review include Apollo, Apollo Applications, Space Shuttle Systems, Interorbital Shuttles, and Space Stations. For each project area, information is presented regarding missions, technical goals, status, and funding. Overall, it is expected that joint NASA-Air Force requirements "for new earth-to-earth orbit and orbit-to-orbit shuttles... will dominate U.S. space development activity for the next decade"; additionally, the space station concepts (which were endorsed by the President's Space Task Group) "set U.S. astronauts clearly on a course... for Mars". As a consequence of these developments and the continued decline in the annual cost of Project Apollo, "funds are likely to be available for a significant number of new programs". "All this is surprising mostly because nothing has changed much for the better economically in the country. Even more surprising, it is happening quietly. The U.S. is indeed entering its second decade in space with a bang, yet it appears to be only a whimper."

4005. "Space Science and Applications", *Space/Aeronautics*, v. 53, no. 1, January 1970, pp. 45-54. Plans and prospects for the space science and space applications programs are reviewed and discussed. The missions, technical goals, status, and funding of several programs are presented: Service Satellites, Solar and Planetary Missions, and Earth-Orbiting Missions. "Aside from a few areas of new developments, [these programs] have largely been marking time, with most programs stretched out to match the diminished funding made smaller still by the nasty bite of inflation." However, funding prospects appear brighter for space applications projects, such as weather forecasting and television relay. On the other hand, the "space science program, with its growing planetary ambitions for the 70s yet with little prospect of increased funding, is steadily shifting its dollar focus away from the earth. Even so, its planetary programs have not survived untrimmed". Several of the programs so affected – either by cancellation, deferment, or fund reduction – are cited.

4006. Normyle, W. J., "NASA to Close Electronics Center", *Aviation Week & Space Technology*, v. 92, no. 1, 5 January 1970, pp. 16-17.

"National Aeronautics and Space Administration, beset by budget squeezes and besieged for its program direction, will preemptorily close the Electronics Research Center .... Closing of the center, at Cambridge, Mass., was forced directly by budget problems but indirectly by an acknowledgement that NASA had overextended its electronics research commitment." Disposition of the center, which is not fully completed, has not been determined. "NASA has a capital investment of $37 million, including $21 million in equipment." Many of the center's 800 employees will probably be transferred to other NASA centers, particularly the Manned Spacecraft Center in Houston, Tex., and the Marshall Space Flight Center in Huntsville, Ala.

4007. "NASA's Troubles", *New Scientist*, v. 45, no. 685, 22 January 1970, pp. 140-141. "From this distance the severe cutting back of US spending on space looks more like orthodox retrenchment than disenchangment with the performance of the National Aeronautics and Space Administration. Certainly it is not to be assumed that money thus saved will be ploughed into even more ambitious assaults on the social problems bedevilling America. There is a growing concern about the economy and it should surprise no one that the Nixon Administration, whose bedrock supporters are the business community, should give the matter urgent attention." The cutbacks mean that "the Moon shots will be spaced at intervals of six months instead of four months between now and the end of next year; ... in 1972 there will be no Apollos at all; ... [and] the unmanned landing probes to Mars due to start in 1973 will be put off for two years". In addition about 50,000 will lose their NASA jobs by the middle of 1971 and the Electronic Research Center at Cambridge, Massachusetts, will be closed.

4008. Barker, A., "NASA: A Split Launching Pad", *BioScience*, v. 20, no. 2, 15 January 1970, pp. 111-112. "For many months the National Aeronautics and Space Administration has been under fire from some scientists who charge that NASA's program is dominated by engineers." Biologists question NASA's scientific stance when the administration failed to include funds for further biosatellite missions in Fiscal Year 1970. The House Committee on Science and Astronautics is holding hearings on the need to continue biosatellite investigations, with attention to these questions: "Are unnecessary risks being taken with the health and safety of astronauts?" and "Should the Congress appropriate huge sums of money for the development of advanced hardware before we have clearer answers to fundamental biological questions?" The article discusses the hearings and a report of the Space Science and Technology Panel, which presents recommendations for changes in NASA's program. These recommendations include: greater emphasis upon innovative

biomedical research, greater use of research capabilities in DOD, AEC, NIH, and the universities; greater efforts for international cooperation; and inclusion of biologically and medically trained astronauts in the manned space program. Congressman Karth (D-Minn.), Chairman of the Subcommittee, has concluded that "there must be more of biomedical and bioscientific experiments with the astronauts and also . . . with primates and subhuman animals".

4009. "NAS Panel Urges Greater Role in Apollo for Science", *Physics Today*, v. 23, no. 2, February 1970, p. 67. "A special study group of the National Academy of Sciences Space Science Board (headed by William Rubey, director of the Lunar Science Institute), has added its weight to the side of science in the current controversy over proper emphasis in the Apollo program. The panel argues that the goal of lunar exploration is the discovery of the origin and history of the moon, not improved technology of spaceflight. It asks for: a greater role for scientists in planning and in the actual landings, more missions, and more time between missions to study the results. The panel also suggests that at least 150 pounds of samples be returned on each flight and that exploration vehicles be developed. The dispute over priorities has become acute since the first Apollo landing last summer; since then several key scientists have quit the Apollo program."

4010. Normyle, W. J., "NASA Plans Fiscal 1972 Increase", *Aviation Week & Space Technology*, v. 92, no. 7, 16 February 1970, pp. 14-17. "National Aeronautics and Space Administration, adapting reluctantly to White House orders for the lowest budget in seven years, already is developing plans for an increase in funding and major new programs in Fiscal 1972." In the physics and astronomy area, NASA plans to ask approval for a high-energy astronomy observatory to be placed in a 200-nautical-mile orbit, a series of Explorer-class spacecraft, and a large space telescope. In the lunar and planetary field, NASA plans to start work on the "Grand Tour mission to send spacecraft past three or more of the outer planets and out of the solar system on a nine-year, far-ranging mission whose development timetable is four years". The bioscience program will seek approval for a new series of Biological Explorer spacecraft to carry a variety of subhuman life forms. Even with such plans, NASA and its contractors "face a bleak future with sharp drops in personnel, heavy cutbacks in field centers and plants, and major deferrals or delays of other key programs". NASA's present work force of 188,300 will be cut to 143,900 by July 1, 1971. The effects of the budget cuts on various NASA programs are discussed.

4011. "America's Next Decades in Space: A Report for the Space Task Group", National Aeronautics and Space Administration, September

1969, 84 pp. This report presents NASA's recommendations for U.S. space goals and activities for the next two decades. The current space program and national capabilities are described, suggested goals and objectives are presented, program plans are outlined, and the values of the space program and international considerations are discussed. The report calls for the U.S. to "adopt as a continuing goal the exploration of the solar system, with men and machines", with "manned planetary expeditions in the 1980's". The major elements of the recommended program include "the early development and operation of a permanent manned station in near-earth orbit", a "low-cost space transportation system", and missions to the planets. Included in the program are "sustained efforts in space astronomy, physics, and biology, relying heavily upon the space station and transportation system". Three "feasible" programs, each including the same activities but differently phased in time and having different resource requirements, are outlined. (This report can be obtained from National Aeronautics and Space Administration, Washington, D.C. 20546, Catalog No. [illegible])

4012. Lewis, R. S., "A Painless Path to Mars", *Bulletin of the Atomic Scientists*, v. XXVI, no. 1, January 1970, pp. 44-45. Future plans for the U.S. space program, as formulated by the Space Task Group headed by Vice President Agnew, are reviewed and analyzed. The recent report prepared by this group appears to have launched the U.S. "on a 16-year engineering and industrial development program leading to inter-planetary manned flight", culminating in a flight to Mars in 1986. "The Mars expedition ... is not set out as a separate and spectacular goal but as the technical climax of a series of lesser, more acceptable programs which lead up to it." The report proposes the construction of specific items of hardware for four purposes: to establish space stations in orbits; to explore the moon; to extend the investigation of the solar system to the outer planets; and to land men on Mars. "The objectives are offered as a package deal, with a price tag of perhaps $80 billion if the nation opts to start the ... Mars Mission in 1986." "Insofar as the program is being adopted ... it can be said that the national decision to go to Mars in the eighties has been made."

4013. Lapp, R. E., "$10 Billion More for Space?", *The New Republic*, v. 162, no. 8, 21 February 1970, 16-19 pp. Referring to NASA's Space Transportation System (STS) as "a new space project ... that could rival the Safeguard ABM as a waste of money", the author describes the system which would cost "about $10 billion", and presents his reasons for believing it should not be developed. The multipurpose space shuttle is aimed at transporting space crews and orbital cargo from Earth to low orbits. "It's clear that powerful forces are acting in concert to promote the new venture. NASA ...

seeks a new lease on life and a means to keep its budget from sliding to obscurity in this decade. Industry, especially the aerospace giants, is desperately hunting for new contracts. The Air Force seeks a place in space and sees in the NASA project the development of an orbital bomber." Among the reasons cited against its development are that other means of "space trucking" already exist, the use of unmanned instruments is receiving greater emphasis, and the space shuttle for military purposes may violate the Outer Space Treaty of 1967. According to the author, "However one views the proposed space shuttle system, it, like the Safeguard ABM, is in search of a mission. It's one more example of technology leading man by the nose to do things just because they are possible."

4014. Roberts, W. O., "After the Moon, the Earth!", *Science*, v. 167, no. 3914, 2 January 1970, pp. 11-16. The author reviews highlights of the NASA space program and proposes for the immediate future that the United States and the Soviet Union cooperate in an "earth-oriented space program that will put the new-found Soviet and American skills in space to work for the direct benefit of man, and with a maximum of international cooperation". Specific areas recommended for collaboration are applications satellites (in areas including meteorology, oceanography, communications, agriculture, and cartography); U.S.-Soviet Venus and Mars exploration programs; and a joint manned space laboratory. Also suggested is the establishment of international space-research centers in developing areas such as Latin America and Africa. "The focus of such centers would be on the research and development that would lead to improvements in exploration for mineral resources, control of agricultural pests, improvement of crops, effective use of forest resources, development of marine resources, prediction of weather and climate . . . ." Also cited is a Global Atmospheric Research Program that the author believes "merits priority attention" in the U.S. space effort.

4015. "Panel Reports of the Commission on Marine Science, Engineering and Resources", Volume 1: Science and Environment, Volume 2: Industry and Technology, Volume 3: Marine Resources and Legal-Political Arrangements for their Development, February 1969, 1106 pp. These volumes contain the reports of seven working panels formed by the Commission on Marine Science, Engineering and Resources, whose task was to make a comprehensive investigation and study of all aspects of marine science in order to recommend an overall plan for an adequate national oceanographic program that will meet the present and future national needs. Each panel assumed responsibility for a major area of interest: basic science; environmental problems; education, training, and manpower; industry and private investment; marine engineering and technology; marine resources; and international aspects of marine activities. "The panel's

were the principal mechanism for assessing the status of marine matters, for identifying opportunities and problems, and for proposing measures to be taken." The report of each panel begins with a summary of findings and recommendations, followed by chapters detailing support for each recommendation, and containing comprehensive information on the panel's findings. (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price $10.25.)

4016. Cheever, D. S., "Marine Science and Ocean Politics", *Bulletin of the Atomic Scientists*, v. XXVI, no. 2, February 1970, pp. 22, 29-34. This article discusses the difficulties and benefits of allocating and exploiting ocean resources. "The fundamental problem is whether existing political-legal arrangements in ocean space are adequate to the task of peaceful resource exploitation. Technological advance rather suddenly has enabled man to exploit new sources of raw materials on the sea-bed beyond the traditional limits of national jurisdiction. Unless the new technology is matched by new modes of international cooperation beyond such limits, there is a danger of increasing the likelihood of international conflict." Among the problems and issues explored in the article are the definition of "beyond present national jurisdiction", the type of regime required and what kind of activities it should perform, the role of the United Nations in solving this problem, the military and political interests involved, the assets and flaws in the present legal regime, and the need for foreign policy to be concerned with the management of ocean resources. The author believes that it "is already late in the day to consider whether the existing regime of decentralized ocean management is effective enough for human needs... If human betterment and world peace are thought to benefit from innovations in international organization, ocean space provides unique opportunities that are in danger of being lost".

4017. "Weather Modification", Tenth Annual Report, 1968, NSF 69-18, National Science Foundation, August 1969, 141 pp. This report describes the 1968 activities of the National weather-modification program. It focuses on the studies conducted and conclusions reached in the areas of precipitation modification; hail suppression; fog dissipation; cloud electricity, lightning, and severe storms; and mathematical models of atmospheric processes and climate modification. Separate chapters are devoted to each of these areas. Notable advances have been made in the development and use of mathematical models and computers, along with increased emphasis on correlation of model-derived data with the information collected in the field; progress is also reported in development of computer models of large-scale atmospheric motions – an essential preliminary step toward any attempt to modify the weather in any broad sense. A chapter on "Social, Economic, Legal, and Ecological Aspects of

Weather Modification" completes the report. Appendices consist of weather-modification activity reports, a summary of weather-modification programs funded by the federal government in fiscal year 1968, and conclusions and recommendations on a Rand Report entitled "Weather Modification Progress and the Need for Interactive Research". (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price 65 cents.)

4018. Fleagle, R. G. (ed.), "Weather Modification: Science and Public Policy", Seattle and London: University of Washington Press, 1969, 147 pp. ($7.95) This book is a collection of ten papers presented during 1966-67 to the Natural Resources Public Policy Seminar, Graduate School of Public Affairs, University of Washington. The goal of the seminar was to examine the problem of weather modification in its totality, "to achieve a new understanding of the problems and potentialities of weather modification and . . . suggest new formulations of necessary and reasonable steps society must take". The chapters cover the following topics: Background and Present Status of Weather Modification; The Physics of Natural Precipitation Processes; The Scientific Basis, Techniques, and Results of Cloud Modification; Evaluation of Weather Modification Field Tests; Statistical Aspects of Weather and Climate Modification; Federal Government Programs in Weather Modification; Ecology and Weather Modification; Weather Modification: When Should We Do It and How Far Should We Go?; Economic Evaluation of Weather Modification; Weather Modification and the Law; and Implications for Public Policy. The central policy issues discussed include society's readiness in terms of knowledge, technology, manpower, and administrative and legal mechanisms to undertake extensive operational cloud seeding for increased water supply; the administrative management of weather modification and related budget allocations; and regulation and possible new legislation regarding weather modification. According to the editor, "public policy implications of cloud modification are significant not only in themselves, but also as a model of a general class of problems likely to be important in the future".

4019. Watkins, H. D., "Opposition Battles SST on Three Fronts", *Aviation Week & Space Technology*, v. 92, no. 1, 5 January 1970, pp. 84-86. The status, prospects, and opposition to the supersonic transport program are reviewed and discussed. The program "has penetrated a thick barrier of political, social and economic opposition to approach the threshold of prototype construction". "The project has not only survived but the growing shadow of the joint British and French and the Russian competitive supersonic transports now flying has sputred support in the past year." "The cornerstone of this support has been the belief that it was critical for the U.S. to continue to dominate the air transport manufacturing field."

Opposition to the program, which is expected to cost $1.3 billion through the prototype phase, has included arguments that it represents misplaced priorities, that it is an improper use of government funds, that it is a threat to the environment, that its economic returns are doubtful, and that its technological viability is questionable. Counterarguments to these lines of opposition are presented. "Despite heated debate, the supersonic transport appropriations generally have moved through the congressional pipelines with a comfortable margin."

5000 SCIENCE, EDUCATION, AND THE UNIVERSITY

5001. "R&D Expenditure Growth Rate Slows in Universities and Colleges", National Science Foundation, News Release NSF 70-108, February 8, 1970, 7 pp. A forthcoming National Science Foundation survey shows that the growth rate of R&D expenditures by universities and colleges has slowed down, primarily because of the leveling off of federal obligations to R&D. This trend, which began in the late 1960's and appears to be continuing, has reduced the growth rate from 17 percent in the 1958-1966 period to 11.6 percent in the 1966-1968 period. More recently, federal support decreased by 2 percent between FY'68 and '69, increased by 2 percent between FY'69 and '70, and is expected to increase by 2 percent between FY'70 and '71. Additional highlights from the survey are presented regarding employment characteristics of scientists and engineers, graduate students, and university-administered FFRDC's. Attachments include statistical data on characteristics of scientists and engineers in terms of type of institution, field, educational attainment, and employment status.

5002. "NASA Lowers Funds", *Chemical & Engineering News*, v. 48, no. 7, 16 February 1970, p. 14. "Not only is NASA's fiscal 1971 budget the lowest since 1962, but NASA's R&D obligations to colleges and universities will drop almost 19% from fiscal 1970." NASA's Sustaining University Program will be terminated in 1971, resulting in the loss of 204 predoctoral traineeships and the closing of the administration and management programs it funded. "Academic scientists who were previously supported by the Office of Space Science and Applications (OSSA) will suffer the severest blow of NASA-funded scientists in fiscal 1971. Although OSSA's budget will increase somewhat . . . R&D obligations to universities will drop almost 17% to $40 million. Biosciences are affected the most, with a 30% cut in funds." "OSSA support of space applications and physics and astronomy research will increase, although R&D support to the universities in the latter field will decrease." Funding to the universities will also be reduced by the Office of Advanced Research and Technology by 11 percent. "The interdisciplinary laboratory centers . . . will continue to be funded, but at a lower level." Finally, the Office of Manned Space Flight will reduce its academic funding by almost 10 percent.

5003. "NSF Changes Thrust of Educational Effort", *Chemical & Engineering News*, v. 48, no. 2, 12 January 1970, p. 48. The National Science Foundation is changing the direction of its educational activities "away from production of Ph.D. scientists and toward aid to a broader segment of students – ordinary students including those not obviously science oriented". Dr. Thomas D. Fontaine, NSF's deputy

assistant director for education, in a speech before the American Association for the Advancement of Science, noted that supply and demand of Ph.D. scientists will be about in balance in the 1970-75 period. He also pointed out that the rate of increase of new Ph.D. programs appears to have "outstripped the nation's capacity to uphold adequate quality". The shift away from production of Ph.D.'s will be in the part of NSF's program that is directed toward specific scientific-manpower-supply problems. The other part of NSF's program, long-range improvement of the quality and character of education in the sciences, will continue. This includes improving teacher competencies and developing high-quality instructional programs, helping selected schools and systems convert the new programs and procedures from prototypes into actual, regular school practices, and developing within given schools their own capability to come up with new and better programs. In 1970 $6.2 million of NSF's funds are allocated for precollege curriculum projects and $4 million for undergraduate curriculum projects.

5004. "Students and Government Funds", *Science*, v. 167, no. 3917, 23 January 1970, p. 359. "House-Senate conferees on the Health, Education, and Welfare and related agencies appropriations bill agreed on language punishing students who participate in campus disturbances but not their colleges and universities. The bill, which seems to be headed for a veto by President Nixon, provides that federal funds may not be used for assistance to students, prospective students, teachers, or employees of colleges and universities who have participated in campus disturbances on or after 1 August 1969. Conferees struck from the bill a requirement that institutions must crack down on rioters or lose federal funds."

5005. "University Environmental Sciences Survey", *Washington Science Trends*, v. XXIII, no. 15, 19 January 1970, p. 87. "The search for solutions to environmental and ecological problems is bringing an 'upheaval to academic organizations', as higher education institutions revamp traditional curricula in favor of multidisciplinary research and training programs. The various interdisciplinary environmental science programs currently being organized across the country are outlined in a new Congressional report. Based on a survey of 1,300 accredited colleges and universities by the Environmental Policy Division in the Library of Congress, the report covers 106 'pertinent' programs dealing with the environmental sciences. The report is expected to 'guide' future Congressional activities which affect agency funding to universities, and may serve as a communications tool among the developing environmental centers, so that schools may compare experiences at the early stages of development." (The report, "Environmental Science Centers at Institutions of Higher Learning", is available from the Subcommittee on Science, Research and

Development, Room 2321, Rayburn House Office Building, Washington, D.C.)

5006. "Cambridge Project Controversy", *Industrial Research,* v. 12, no. 2, February 1970, pp. 21-22. Controversy concerning Project Cambridge, a Harvard-MIT computer project funded by the Department of Defense (DOD), is discussed. The aim of the project is "to bring together behavioral scientists and computer experts to improve computer technology for furthering social science". Possible uses for the project include "research on manpower employment in the U.S.,... new approaches to organizing... libraries, the growth and operation of complex political systems, and, to the horror of radicals in the Cambridge community, studies on the effectiveness of communications between the USSR and Communist China, and social organizations among villages in Vietnam". "Protests against the project, on the grounds that it will depersonalize people and stifle legitimate nationalistic movements in foreign countries at the whim of the U.S. defense establishment, continued throughout the summer." "The criticism continued even when project directors affirmed that they did not intend to carry out secret work, and that its facilities would be available to any group of scientists who wanted to use them." Although Harvard has not taken "a formal interest" in the project, a student-faculty committee "recommended that Harvard should participate officially if certain conditions designed to reduce the influence of DOD on the project were met".

5007. Gruchow, N., "Columbia Curbs Classified Research", *Science,* v. 167, no. 3917, 23 January 1970, p. 362. "The Columbia University Senate last week moved to disassociate the university from all classified research projects, whether financed by government or industry. The student-faculty-administration body agreed on a seven-point policy which has two major themes. First, the faculty may not take on classified contracts in which the university is involved directly or indirectly. This prohibition does not extend to individual consulting arrangements. Further, if a faculty member wishes to take a classified contract in which the university would be involved, he may petition a review board (elected by the Senate) and he may appeal the board's decision to the Senate's committee on external relations and research policy. Any exceptions must be publicly announced. All existing contracts must be modified or terminated within 1 year to comply with the new rules. The policy's second major point is that outside contractors cannot tell the university how to conduct research projects. Contractors may not regulate the religious or political affiliations or the race of persons working on projects; nor can contractors veto publication of the results. Currently, Columbia has five classified research projects." "Classified research contracts now amount to three-quarters of a

million dollars at Columbia; the total for all externally-funded research is $70 million."

5008. **"Stanford Research Institute"**, *Science*, **v. 167, no. 3917, 23 January 1970, p. 359.** "Stanford University has agreed to give up control over the Stanford Research Institute, target of student demonstrations for its involvement with war-related contracts, for payments of more than $25 million to the university. Under the terms of the agreement, SRI will keep its name for not more than 5 years; it will continue as a nonprofit research organization; SRI's board of directors (formerly elected by Stanford trustees) will assume complete responsibility for the institute. Payments will begin in 1971 and spread over a period of years. SRI undertakes more than 750 new research projects each year in a wide variety of fields; its revenues last year totaled about $58 million."

6000 SCIENCE MANAGEMENT AND POLICY-MAKING BODIES

6001. "Technology Assessment", Hearings Before the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics, U.S. House of Representatives, Ninety-first Congress, First Session, November 18, 24; December 2, 3, 4, 8, and 12, 1969, 501 pp. These hearings are directed to developing a congressional mechanism that will "produce expert and independent information to the Gove nment with regard to the potentials, good and bad, of newly developing technology" to aid in management decisions. The goal of the hearings is to set up a "technology assessment capability" for the legislative and executive branches of government. The assessment procedure would include setting of priorities, continual alertness for signs of unforeseen consequences or opportunities, selection of specific assessments to be made, contracting with groups for performing, assessments, coordination with executive-branch assessment efforts, public hearings to receive assessment results, staff analysis of results, resolution of controversies, and referral of funds to the appropriate standing committees for action. The hearings include statements by Dr. W. D. McElroy (NSF), Dr. L. Quincy Mumford (Library of Congress), Dr. Lester S. Jayson (Legislative Reference Service), Dr. Herbert L. Ley (FDA), Dr. Louis H. Mayo (Program of Policy Studies in Science and Technology, The George Washington University), Elmer B. Staats (Comptroller General of the United States), Dr. Lee A. DuBridge (Office of Science and Technology), and Dr. Emmanuel Mesthene (Program of Technology and Society, Harvard University). Several papers and reports on technology assessment are included as appendixes. (The report can be obtained from the U.S. Government Printing Office, Washington, D.C. 20402.)

6002. "Proceedings of the Engineering Foundation Research Conference on Technology Assessment", Proctor Academy, Andover, N.H., 4-8 August 1969, Appendix O of "Technology Assessment", Hearings Before the Subcommittee on Science, Research and Development of the Committee on Science and Astronautics, U.S. House of Representatives, Ninety-first Congress, First Session, November-December 1969. This report of the proceedings of the Engineering Foundation Research Conference on "Technology Assessment" includes papers presented on "Technology Assessment – A New Responsibility"; "Technical Information and the Congress"; "The Four Faces of Techno'ogy Assessment" (keynote address by Rep. Emilio Q. Daddario); "Historical Aspects of Technology Assessment"; "New Mechanisms for Technology Assessment"; "Pollution Problems, Resource Policy, and the Scientist"; and "A Forecast of

Technological Trends, Their Societal Consequences and Science Policy Strategies of the Future". The report also contains reviews of the technology-assessment studies conducted by the National Academies of Sciences and Engineering. General areas covered during the proceedings were the "what and how" of technology assessment, environmental crises and technology assessment, and techniques for predicting the future. (This report can be obtained from the U.S. Government Printing Office, Washington, D.C. 20402.)

6003. Bauer, R. A., et al., "Second-Order Consequences: A Methodological Essay on the Impact of Technology", M.I.T. Press, Cambridge, Mass., 1969, 240 pp. ($12.50). This book "concentrates on the problem of managing the consequences of technological change in a broad sense" with particular focus on the space program. The three parts into which the book is divided are "The Problem: Anticipating and Measuring Effects" (with chapters on "The Secondary Impact of Technology", "The Task of Anticipation", and "Measurement Over Time"); "The Product: Some Selected Effects" (with chapters on "A Strategy for Studying Second-Order Effects", "The Public Reaction", "Mediating Institutions", "Space and Man's Imagination", "Manpower: The Special Case of Technicians", and "New Perspective on Technicians"); and "The Process: The Way Effects Happen" (with a chapter on "The Transfer of Space Technology"). A final chapter summarizes the conclusions regarding the social consequences of the space program.

6004. Kasper, R. G. (ed.), "Technology – The Proceedings of a Seminar Series", January-April 1969, Program of Policy Studies in Science and Technology, George Washington University, July 1969, 164 pp. The proceedings of the Seminar Series on Technology Assessment consisted of four sessions; during each a paper was presented followed by a discussion period. Clarence Danhof, Senior Staff Scientist of the Program on Policy Studies, presented the first paper entitled "Assessment Information Systems"; it "called attention to some of the problems involved in obtaining information necessary for the assessment function". The second paper, by Richard A. Carpenter, Senior Specialist in Science and Technology for the Science Policy Research Division of the Legislative Reference Service of the Library of Congress, dealt with "Technology Assessment and the Congress"; he considered the needs of Congress in assessment activities and the present role of the Legislative Reference Service in fulfilling them. Harold P. Green, Professor of Law and Director of the Law, Science and Technology Program of The George Washington University National Law Center, presented a paper on "The Adversary Process in Technology Assessment" in which he proposed the establishment of an organization to determine and publicize the detrimental aspects of technological applications. Louis H. Mayo, of the Program of Policy

Studies in Science and Technology, considered "The Management of Technology Assessment", stressing the total-problem approach to assessment. (For sale by the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151. Price $3.00.)

6005. Mayo, L. H., "The Relationship of Technology Assessment to Environmental Management", Staff Discussion Paper 206, Program of Policy Studies in Science and Technology, The George Washington University, October 1969, 34 pp. The author defines technology assessment as the "capacity to identify the full range of impacts (direct and derivative, immediate, intermediate, and long-term) and to evaluate the social desirability or undesirability of such effects as they relate to particular technological applications". Two basic approaches to assessment are described: Total Impact Assessment, in which a technological application is assessed "for the purpose of identifying all significant social impacts and evaluating the social desirability or undesirability of such effects"; and Partial Special Purpose Assessment, in which a specific social problem is the basis for assessment. With regard to environmental management, Total Impact Assessment is recommended and details for its implementation are outlined. Using this approach, "an assessment data base can be established which would serve not only the requirements of environmental quality control but all other social problem areas wherein such applications are in some manner involved". The "Congressional need for more comprehensive and reliable assessment data on technological applications" is also discussed. (This report can be obtained from the Program of Policy Studies in Science and Technology, George Washington University, Washington, D.C.)

6006. Krieger, J. H., "Technology Assessment and Industry's Role", *Chemical & Engineering News*, v. 48, No. 3, January 19, 1970, 32 pp. The concept and status of technology assessment is briefly reviewed and the role of industry in the effort is discussed. "Technology assessment is mostly concerned with the indirect impact of technological developments on society and the environment"; and even though "the methodology for establishing a methodology is still a matter of some debate ... there seems little question that technology assessment will be institutionalized in some form. It is important ... to see that the institution, like the technology it attempts to assess, produces the desired and needed results without harmful indirect and secondary effects". "However unclear the development and implementation at this point, technology assessment is clearly a concept whose time has come." "Although most current discussion has been undertaken by persons and committees connected with the Federal Government, actual plans should involve industry. Technology assessment belongs in the corporate board rooms and the engineering conference rooms as much as in the halls of government. And now ... is the time for industry to begin its involvement."

6007. Allison, D., "Measuring the Good and the Bad of New Technology", *Innovation*, no. 9, 1970, pp. 44-55. Current efforts in technology assessment are surveyed and some questions are raised regarding our capability for such assessment and the possible consequences of doing so. The frequently cited needs for better control of the applications of science and technology are presented, and some efforts toward this end – mainly, the two reports on technology assessment prepared by the National Academies of Sciences and Engineering – are reviewed. The author questions our present capability to assess technology and to reliably forecast consequences, especially those of a higher order: "We are far from having the skills to do this." In addition, he asks that if "economic growth is dependent upon ... products of technological innovation, what happens to that growth when technology comes under control?" Beyond this, the author questions whether assessment really solves the "basic problem" (over-population) or whether it "merely postpones a real solution". "[Unless] that problem is solved, no amount of technical assessment and control will be sufficient."

6008. "Regulation and Control vs. Research and Development", *Washington Science Trends*, v. XXIII, no. 13, 5 January 1970, pp. 73-74. Some of the changing directions in U.S. science policy are cited and briefly discussed. One of these is the expected "increased regulation and control of technology during the decade ahead, with the Nixon Administration leading the way". This change stems from several factors: "... a growing distaste for war and defense-related research ... as well as the reduced funds for such purposes"; "... concern with the deteriorating environment and 'quality of life' "; and the concern with social problems. Another expected change "will be centered upon attempts to 'transfer' known technology to the civilian sector of the economy" from the technology developed for military and space purposes; to date, such attempts "have often faltered or failed as they come into contact with the 'real world' problems of apathy, politics and funding". In other fields, such as medicine and space, decisions are yet to be made as to whether, for example, medical dollars should "go to the laboratory or the clinic or the classroom". "The first definite clues on how these choices are to be made ... are already in" and the "key word is likely to be 'environment' ", with the "principal weapons ... likely to be regulation and control".

6009. Brezina, D. W., "The Rise and Demise of the Senate Subcommittee on Government Research", Staff Discussion Paper 406, Program of Policy Studies in Science and Technology, The George Washington University, Washington, D.C. November 1969, 31 pp. This report describes the strategy, activities, and subsequent disbandment of the Senate Subcommittee on Government Research, which

existed from July 1966 through the fall of 1969. Its primary purpose was to "stimulate a dialogue on science policy affairs and thereby give the problems and issues more national visibility". The subcommittee, which was in session a total of 63 days and which was chaired by Senator Fred Harris (D-Okla.), received testimony from 371 witnesses, including almost all of the leading experts on science policy. The four main areas of inquiry were the social sciences, biomedical research, geographical distribution of research funds, and procedures for grants and contracts. According to the author, the "proliferation of subcommittees and a continuing intense budgetary squeeze in the Senate, coupled, implicitly, with a decreasing Congressional interest in science affairs tended to bring about the demise of the Senate Subcommittee on Government Research and the loss of the focal point of science policy in the Senate". (This report can be obtained from the Program of Policy Studies in Science and Technology, George Washington University, Washington, D.C.)

6010. Lepkowski, W., "Kennedy to Fill Science Gap", *Scientific Research*, **v. 4, no. 26, 22 December 1969, p. 18.** "Sen. Edward M. Kennedy is hoping to fill the Senate science-policy vacuum left by the demise of Sen. Fred R. Harris's subcommittee on government research. Kennedy plans to broaden the scope of his small subcommittee on the National Science Foundation next year to include the kinds of issues covered in the House by Rep. Emilio Q. Daddario's subcommittee on science, research and development. Among the subjects Kennedy expects to explore in hearings next year are the impact of defense R&D cutbacks on university science programs, . . . sluggishness in applying science and technology to pollution cleanup, the application of science and technology to solving crimes, and how to achieve a higher quality of life by the year 2000. Also getting involved in scientific issues are Sen. Jennings Randolph, who is setting up a subcommittee to look into the applications of technology to society, the quality of life, and the environment; and Sen. Edmund S. Muskie, who hopes to form a select committee on technology and the human environment."

6011. "Daddario Seeks Governorship", *Science*, **v. 167, no. 3921, 20 February 1970, p. 1104.** "Representative Emilio Daddario (D-Conn.), who is considered one of the strongest congressional supporters of science, has announced his candidacy for the governorship of Connecticut after 12 years in Congress. Daddario is a member of the House Committee on Science and Astronautics, and chairman of its Subcommittee on Science, Research, and Development, which oversees the budget of the National Science Foundation."

6012. "Health Budget Fight to Spawn Science Lobby", *Scientific Research,* **v. 4, no. 26, 22 December 1969, pp. 11-12.** "Out of the

current, determined, and likely to be successful fight to save the health research and manpower budget from congressional budget-cutting may well come a functioning 'science lobby' in Washington." "The coordinated efforts of several health associations and university organizations to win full congressional funding for the Administration's $3.4-billion health budget are expected to lead to the establishment of some sort of continuing organization to fight over the years for a strong scientific research program in universities and medical schools." Campbell Moses, medical director of the American Heart Association heads the Ad Hoc Committee on the Nation's Health Crisis, which is made up of delegates from 24 health associations, including the Federation of American Societies for Experimental Biology, the American Heart Association, the American Cancer Society, the American Hospitals Association, the Federation of Associations of Schools of Health Professions, and the Association of American Medical Colleges. The activities, impacts, and prospects of the Committee are discussed in the remainder of the article.

6013. Nelson, B., "HEW's Security", *Transaction*, v. 7, no. 3, January 1970, pp. 5-6. "[The] rigid security system which the Department of Health, Education and Welfare has maintained since its creation in 1953 . . . has barred hundreds of social and natural scientists from scholarly service on HEW's advisory boards." Increased publicity since the initial reporting of the system of discrimination in the June 27, 1969 issue of *Science* has increased the pressure on the administration to look into and change HEW's internal security system. The author describes several cases in which scientists have been excluded through this system. He believes it would be relatively easy for the security check system to be changed. "HEW could probably fulfill any security obligations it has for advisory panel appointments by relying on the comments and recommendations of scholarly colleagues already contacted in the nomination process without adding a search through the files of the Civil Service Commission and the FBI." The author suggests that scholars worried about the injustices of the HEW security system should make their views known to their congressmen and the HEW Secretary, both individually and through professional organizations and universities.

6014. Nelson, B., "HEW: Blacklists Scrapped in New Security Procedures", *Science*, v. 167, no. 3915, 9 January 1970, p. 154-156. Robert H. Finch, Secretary of the Department of Health, Education and Welfare, has announced changes in the selection and appointment of advisers that eliminate the highly criticized practice of blacklisting scientists. The revisions announced by HEW for the appointment of advisers and consultants include: (1) "The present practice of pre-appointive investigations by the HEW's Office of Internal Security will be discontinued"; (2) "HEW's constituent agencies . . . will be

responsible for evaluating prospective advisers and consultants"; (3) "'Appointments will be made on the basis of professional competence, that is integrity, judgment and ability'"; (4) "If an agency has evidence that a prospective appointee has traits that would so adversely affect the performance of his job as to disqualify him, that individual will be given the opportunity to challenge the evidence either in person or in writing"; (5) "Instead of the preappointment investigation for loyalty, the appointee will be required to sign an affidavit." The changes resulted from a study by Undersecretary John G. Veneman, Jr., and from a report and recommendations by Harlan Reed Ellis of Columbia University.

6015. **Myers, S., and Marquis, D. G., "Successful Industrial Innovations: A Study of Factors Underlying Innovation in Selected Firms", National Science Foundation, NSF 69-17, May 1969, 117 pp.** This report summarizes the results of a study of "the factors which stimulate or advance the application in the civilian economy of scientific and technological findings". The study, which was conducted by the National Planning Association, took the form of a statistical investigation of innovations in five selected industries – railroad companies, railroad suppliers, housing suppliers, computer manufacturers, and computer suppliers. "The results are presented in a manner intended to highlight the differences, or similarities, of the innovative process in the several industries." Separate chapters describe the process of innovation, the methods used in selecting the firms and innovations for study, case reports to illustrate the kind of information secured for each innovation, the characteristics of the innovations introduced by firms in different industries, the primary factors in the initiation of the innovation, and the major information inputs which evoked the ideas for the innovation and which contributed to the problem-solving stage. A final chapter summarizes the principal findings and explores their implications for the management of the innovation process. (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price 55 cents.)

6016. **Byatt, I.C.R., and Cohen, A. V., "An Attempt to Quantify the Economic Benefits of Scientific Research", Science Policy Studies, No. 4, Department of Education and Science, April 1969, Her Majesty's Stationery Office, London, 25 pp.** "The purpose of this note is to outline . . . a method whereby a significant part of the benefit . . . of curiosity-oriented research in science might be quantified, and to propose a series of studies to refine and apply the technique proposed." The technique appears to involve determination of the "discounted cash flow" resulting from such research. The types of economic benefits treated by the technique include new industries that arise from basic research, technological improvements in existing industries, and the accelerated commercial applications of

foreign scientifical discoveries. Details of the technique, examples of its application, and proposed future studies are presented. The studies involve the examination of the "financial pattern of a number of science-based industries" which are "based clearly on one or more previous scientific discoveries". (This report can be obtained from the Secretariat, Council for Scientific Policy, Department of Education and Science, Curzon Street, London W1Y 8AA.)

6017. **Arnfield, R. V. (ed.), *Technological Forecasting*, Edinburgh University Press, 1969, 417 pp. ($12.60).** This book is a collection of papers presented at the University of Strathclyde Conference on Technological Forecasting held in Glasgow in June 1968. The book is divided into three parts; the first is concerned with general aspects of technological forecasting and its application, the second with forecasting techniques, and the third with forecasted "futures". The 30 papers comprising the book include "Technological Forecasting as a Tool of Social Strategy" by Robert Jungk, "Technological Forecasting and the Planning of R and D" by David R. Coates, "Planning Economic Development" by R. H. Collcutt, "Forecasting the Interactions between Technical and Social Changes" by Oto Sulc, "Energy Patterns to the Year 2000" by Hugh Harvey and E. V. Newland, "Technological Forecasting Applied to Urban Development" by Lloyd P. Smith, and "Forecasting Developments in Transportation" by H. L. Bos. Other articles deal with forecasting and planning in particular industries (e.g., computer, construction, and nuclear marine propulsion) and countries (including France, Poland, and Sweden).

6018. **"National Science Foundation: Annual Report, 1969", NSF 70-1, National Science Foundation, Washington, D.C., 1969, 137 pp.** This 19th annual report of the National Science Foundation describes the major activities conducted by the Foundation in fiscal year 1969. Obligations totaled $433 million (as compared with $505 million in 1968), with 52 percent going to the support of scientific research, 25 percent to science education, and 11 percent to institutional support of science. "[The] overall drop in fiscal year 1969 NSF obligations is reflected in almost all fields .... Only the social sciences and engineering maintained the previous year's level and the sharpest declines occurred in the support of the life sciences and the earth sciences." (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price: $2.00.)

6019. **Wells, J. G., et al., "Contract Research and Development Adjuncts of Federal Agencies: An Exploratory Study of Forty Organizations", PB 187945, Denver Research Institute, University of Denver, March 1969, 400 pp.** The purpose of this study was to "provide a better understanding" of this type of R&D organization (the federal contract research center) that is largely financed by a

single federal agency and that was usually established at the latter's initiative. The study reviews the origins and evolution of the centers, examines their characteristics and compares them with other R&D performers, assesses the advantages and disadvantages of the centers, and considers various policy issues associated with this type of organization. Overall, the study concludes that the centers have "unique advantages in the performance of unusually large, integrated, basic research activities centered around expensive scientific instruments", in the performance of system analysis and planning activities, in systems engineering and technical direction, and in applied R&D. The adjunct mechanism has "no inherent weaknesses . . . which cannot be surmounted if current problem areas are given sufficient attention".

7000 SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE

7001. "Defense R&D Slashed by Frugal Congress", *Industrial Research,* v. 12, no. 2, February 1970, p. 26. Congress has cut $829 million from the Department of Defense's research requests. "In proposing most of the cuts, the House Appropriations Committee said [that it] feels that the number of new weapons systems and equipment being developed is not sufficiently large nor are the new items technologically advanced over previous weapons and equipments . . . to fully justify increased expenditure of the magnitude requested." In addition, the "specifications for new weapons too often call for the scientifically possible rather than the militarily practical". "The committee also charged that many R&D programs are actually shells set up as a bank for other programs that may need additional funds, that low estimates have been given for program costs in order to fit more programs into the budget, and that military services needlessly duplicate work being done by other services." "The R&D appropriations are as follows: Army, $1.596-billion, down $253-million from the administration's request; Air Force $3.060-billion, down $501-million from the request; Navy, $2.186-billion, down $25-million from the request; Defense agencies, $450-million, down $50-million from the request."

7002. "Daddario's Warning on Strict Military Funding", *Industrial Research,* v. 12, no. 2, February 1970, p. 25. "As the Defense Department begins a review of its research grants to weed out those not related to the military, the chairman of the House Research & Development subcommittee is urging caution lest a major disruption in basic scientific research occur. Rep. Emilio Q. Daddario . . . is warning Congress of the dangers of too drastic an application of section 203 of the defense procurement act. The section says military funds may not be used for research projects that do not have a 'direct and apparently relationship to a specific military function'." Daddario is concerned that "on-going research will be disrupted by the across-the-board application of the act" and that agencies intending to pick up basic research responsibilities from the Pentagon might not be funded because of budgetary restrictions. Daddario recommends that all transfers of projects be made in a " 'time-phased and orderly manner' ", and that Congress not make the section effective until next year.

7003. "No Home for a Weapons Lab", *Science News,* v. 97, no. 3, 17 January 1970, p. 62. The status and future of Fort Detrick, "the focus of much of the Pentagon's basic research on chemical and bacteriological warfare", is reviewed and discussed. Several factors –

the cessation of work on bacteriological warfare, restriction of the Department of Defense to directly relevant basic research, and the general tightening of government-wide R&D budgets – combine to put in doubt the future of Ft. Detrick and the more than 800 scientists and technicians employed there. "Dismantling it is regarded as a waste of the first-class research facility. Finding another Government agency that wants – and can afford – another laboratory raises its own problems". Discussions have been started with the Department of Health, Education and Welfare to see if the facilities could be used for research on possible viral causes of cancer; in this connection, it has been suggested that the National Institutes of Health "might use Ft. Detrick as an in-house agency to do some of the research it now contracts out".

7004. "Scientists, Engineers, and Physicians from Abroad, Fiscal Year 1968", *Reviews of Data on Science Resources*, National Science Foundation, no. 18, November 1969, 20 pp. This report contains data concerning the number of scientists, engineers, and physicians immigrating to the United States in the fiscal year 1968. Highlights of the report include: nearly 13,000 scientists and engineers and 3,100 physicians and surgeons became immigrants in the U.S., a growth of less than 4 percent over the 1967 level of scientists and engineers and a decline of 8 percent in the number of physicians; the United Kingdom and India were the largest source of immigrant scientists and engineers (2400 and 1400, respectively); over 4100 scientists and engineers were already living in the U.S. at the time they became immigrants and nearly 70 percent entered originally as students; 92 percent of the scientists and engineers and 75 percent of the physicians were males; almost one-half of the scientists and engineers from abroad were under 30 years of age and 62 percent of the physicians were between 30 and 44 years old; and over one-half of the immigrant scientists and engineers chose New York, California, Illinois, Washington, or New Jersey as their intended residence. Additional data are provided on specific occupations, country or region of birth, country or region of last permanent residence, age and sex of immigrants, and state of intended residence. (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price: 20 cents.)

7005. Byrnes, R. F., "Exchanges of Scholars with the Soviet Union: Advantages and Dilemmas", Memorandum on International Negotiation prepared for the Subcommittee on National Security and International Operations, Committee on Government Operations, United States Senate, 91st Congress, First Session, 17 October 1969, 19 pp. This memorandum reviews the exchange of scholars between the United States and the Soviet Union and discusses related benefits and problems. Benefits include the opportunity for American and Russian

scholars to increase their understanding of the other country, recognition of the U.S.'s "special obligation to assist scholars in other countries", establishment of "new patterns of cooperation" among American universities, and the opportunity provided for reinforcing peaceful relations between the two countries. Problems include the amount of administrative time and energy required, the dilemmas posed by the university being transformed into an "action agency" within public life, the degree of influence American scholars often must surrender to the Soviet government, and the tendency for the Soviets to serve their own interests and weaken those of the U.S. "[The] very nature of the exchange program raises very difficult problems for the Soviet Union [and] the Soviet rulers constantly discuss the balance between the advantages they acquire and the 'infection' which may constitute the price." "To obtain gains which it thinks important, even crucial, it must risk contamination of its intellectual elite and of the ideological future of the country." The author suggests the establishment of a coordinating organization in the U.S., comprising the universities, government, and scholarly organizations involved, to have full authority for all cultural exchange programs with Communist countries. (This report can be obtained from the U.S. Government Printing Office, Washington, D.C. 20402.)

8000 INTERNATIONAL SCIENCE POLICY

GENERAL

8001. *Manual for Surveying National Scientific and Technological Potential*, Science Policy Studies and Documents, No. 15, Unesco, 1970, 251 pp. This manual is intended for use by specialists in surveying a country's scientific and technological potential (STP). "It describes ... a methodology for executing the various stages in conducting a survey of STP and exploiting it in the formulation of science policy at the national level." National scientific and technological potential consists of the following elements: (1) the human resources in science and technology, (2) the financial resources devoted to science and technology, (3) the physical resources devoted to scientific production, (4) scientific and technological information centers and services available, (5) research programs in progress and projected, and (6) "decision centers" relevant to the country's scientific and technological activities. Part One of the manual deals with the collection of data, including types of information to be collected, methods of collection, difficulties to be avoided, and fields to be covered. Part Two deals with methodological aspects of the processing of the data (both numerical and descriptive) implied by systems analysis. Part Three deals with the methods used for exploiting the data of the STP survey and explains the principles of scientific management techniques and their application to science policy formulation. (For sale by the Unesco Publications Center, P.O. Box 433, New York, N.Y. 10016. Price: $3.50.)

8002. Baldwin, G. R., "Brain Drain or Overflow?", *Foreign Affairs*, v. 48, no. 2, January 1970, pp. 358-372. The "brain drain" problem – its existence, extent, causes, effects, and possible solutions – is reviewed and assessed. Although the "drain" exists, the "size of the flow is large", and it "is increasing at a rapid rate", the author believes that "there is a great question whether this migration is seriously hurting the countries" that are losing their "highly trained personnel". He believes that in many instances developing countries are being relieved of scientific manpower that they cannot use, and that some developing countries are educating scientists and professionals at a rate "faster than their economies can absorb them". What is of greater concern than gross migration statistics is the loss of "key men" ... the outstanding individuals who are unlikely to be satisfactorily replaced even if a country has dozens of men with the same educational qualifications waiting to apply for their posts". Emigration patterns in several development areas – East and Southeast Asia, India, East Africa, the Middle East, and Latin America – are

reviewed and the causes discussed. Overall, "concern for the [brain drain] problem is on the ebb"; the "outlook ... is that little or nothing will be done by governments or by the United Nations to deal directly with the problem. Thus, half a decade of concern about the brain drain seems to be ending not with a series of proposals for reform but with a 'decision by default' to enter the 1970s with the ground rules on migration left essentially unchanged in both gaining and losing countries."

8003. Greenberg, D. S., "European Science: Financially, Politically, It Has Trouble Too", *Science*, v. 166, no. 3909, 28 November 1969, pp. 1122-1126. The financial and political problems of science in Western Europe (especially in Germany, France, and the U.K.) are discussed and compared with the current U.S. situation. The author notes that "Americans who are displeased with the amount of federal support for research have lately taken to warning that scientific superiority may pass to Western Europe". To the contrary, the author contends, "the nations of Europe have an immensely long way to go in most fields before they approach even the now-wavering level of scientific activity in the United States". After reviewing conditions in Germany, France, and the U.K., the author discusses the status and prospects for the major multinational programs (CERN, ESRO, ERATOM, EMBO) and concludes that these joint efforts, with the possible exception of CERN, have so far failed to overtake U.S. efforts. "It is no consolation for the American scientific community, but the fact is that ... Europe does not offer a healthy contrast to the situation that prevails in the United States."

8004. "Thinking Europeans", *New Scientist*, v. 44, no. 678, 4 December 1969, p. 493. "Scientists and industrialists are going to play just as vital a role in uniting Europe as politicians" as evidenced by "the recent invitation from the Common Market countries to Britain and others to talk in detail about the collaborative projects in science and technology put forward by the Aigrain committee". The seven main areas of discussion are pollution control, meteorology, telecommunications, data processing, new means of transport, oceanology, and metallurgy. "It is expected that replies from Britain and the other countries invited – Norway, Denmark, Sweden, the Republic of Ireland, Switzerland, Austria, Portugal and Spain – will have arrived by early next year. After that, officials of the participant countries will probably get down to more detailed discussions of what machinery to set up." "In the meantime, the work on a proposed International Institute of Technology in Europe is going ahead steadily. This foundation, where European managers would be equipped with the skills needed to handle technology most effectively, has been under consideration for some time, and the report of the working party ... is expected before the year end." The "most

valuable feature" of these collaborative ventures is "that they are getting Europeans to think together".

8005. Greenberg, D. S. "Son of Technology Gap: European Group Setting Up an Institute", *Science*, v. 167, no. 3919, 6 February 1970, pp. 850-852. A European group of leading figures in industry, government, science, and education, called The Study Committee, is planning to establish the "International Institute for the Management of Technology", a graduate institution for study and research that will resemble the better American schools of business administration. Scheduled to open late this year in a renovated former monastery donated by the city of Milan, the Institute has the formal backing of Britain, West Germany, France, Italy, and the Netherlands. It will offer a variety of courses in the "management sciences" and within 3 years expects to have an enrollment of 500 students a year and a faculty of 65. The proposal for the Institute grew out of the Committee's conclusion that the technology gap was really a "management gap" stemming from "Europe's relative paucity of scientists and engineers in top industrial positions"; the Committee recommended that the proposed Institute function as a management training and research center for "established scientists and engineers" and that it be established as a collaborative project of the member countries of OECD.

8006. "NATO Into the Attack", *New Scientist*, v. 44, no. 676, 20 November 1969, pp. 387-388. "It now seems certain that early next month the Foreign Ministers of NATO countries will set up the Committee on the Challenges of Modern Society that President Nixon called for in April [1969]." Daniel Moynihan, the President's advisor on urban affairs, has suggested that "pollution, population growth, inadvertent weather changes, and the impact of the automobile on society are the kind of problems that the committee should tackle". "Although greater international collaboration is clearly needed in all the areas specified by Dr. Moynihan, it is doubtful whether an alliance that stretches from California to the Caucasus is the best framework for the execution of environmental policies. Some problems are most effectively tackled within a more limited regional context .... Others are best dealt with on a global or, at any rate, a hemispherical level." However, the "exchange of information that is now a NATO habit in such matters as defence budgeting, military deployment, and crisis diplomacy could with profit be extended into other zones of interaction between politics and technology. The resources of various armed services might be mobilized more widely than previously for tasks such as meteorological observation, the monitoring of pollution, and disaster relief." A "most appropriate topic for the new NATO committee to tackle" would be "the safe disposal of the vast amounts of plutonium-239 that in five or ten

years time will be pouring out, as a waste product, from nuclear power stations".

8007. "New European Organization", *Nature*, v. 225, no. 5234, 21 February 1970, pp. 677-678. "A new European Cell Biology Organization (ECBO) has been established at Leiden in the Netherlands. Its aims are to promote research in cell biology and to foster international cooperation through exchange of inform and people. It intends to promote three types of activity – sm.ll working groups studying specific topics, two-day symposia, and exchange of individuals among institutions in Europe. But, unlike the European Molecular Biology Organization (EMBO), ECBO has no intention, as yet, of setting up its own laboratory." "ECBO will levy no subscription charges on its members, but its executive committee is not sure at the moment where the money to finance its activities is going to come from. It hopes that the symposia will be self-financing, and that some money will be forthcoming from other organizations and perhaps from scientific foundations, but it wants to avoid having to take money from government sources because this might limit participation from Eastern European scientists." "Membership of ECBO will be made up of registered cell biologists, together with representatives of other European organizations, such as the International Society of Cell Biology, the International Cell Research Organization, EMBO, and national societies."

8008. "CERN Accelerator: Still in the Air", *Nature*, v. 225, no. 5227, 3 January 1970, p. 4. "Once again the CERN Council has failed to come to a firm decision on the fate of the 300 GeV accelerator project. At the council meeting on December 18 and 19 it was decided that the six countries which have announced their intention to join the project would hold a ministerial meeting in the very near future, and that the CERN Council would reassemble in March or earlier to reach a final verdict. The Swiss Government has agreed to organize the ministerial meeting, in which the governments of Austria, Belgium, France, Italy, Switzerland and West Germany will be represented. The implication of the report issued by the CERN Council after the meeting is that the site for the accelerator, not the fate of the project itself, is the next question to be discussed." "The Council has also approved the budget for the Meyrin (Geneva) site up to the end of 1973. This has been done in the context of a plan of development for the site up to 1975. In 1970, 244.1 million Swiss francs will be spent on the basic research programme, compared with Sw. fr. 235.2 million in 1969."

8009. "CERN Accelerator: No Room for the Ring?", *Nature*, v. 225, no. 5230, 24 January 1970, p. 310. "There is danger that the discord over the siting of the proposed 300 GeV CERN accelerator may cast

a shadow over the role of West Germany in European scientific collaboration. In German eyes, the issue revolves around the glaring imbalance between the economic and political influence of West Germany, whereby the Federal Republic shoulders the largest financial burden in European scientific ventures and yet has no important European project on its soil." "The CERN Council has always maintained that the location of the accelerator must be decided on scientific grounds alone. The West German view, however, is that any of the five sites put forward by the participating countries is suitable . . . It is pointed out that none of the important European scientific centres is in West Germany." "The whole concept of scientific cooperation is placed in jeopardy once a major partner starts trying to impose political decisions on a joint scientific project."

8010. "CERN's Accelerator: Delay and Growing Despair", *Science News*, v. 96, no. 26, 27 December 1969, pp. 593-594. "It is rapidly reaching the point where the biggest danger to the giant proton accelerator planned by the European Organization for Nuclear Research (CERN) is the delay in getting it started." "The latest blow . . . is West Germany's announcement that it will not pay its share of the cost unless a site is selected within its boundaries." "The problem concerning the CERN member nations is that to make the $334 million investment pay, the project must be started in time to keep the United States' 200-400 billion-electron-volt National Accelerator Laboratory from getting too big a technical lead." "The accelerator survived a major setback 18 months ago when Britain decided to pull out of the project." "The recalcitrance of West Germany, however, is potentially far more serious than Britain's withdrawal; Britain's action came with time remaining in which to reappraise, reapportion and cut costs. Now, with time a key factor, Germany's share of as much as $120 million – almost 36 percent of the total cost – probably represents a life-or-death difference for the project." "Unless a German site proves acceptable – France, Austria, Belgium and Italy are also in the running – the accelerator's chances depend on CERN's getting Germany to change its stand."

8011. "French Lasers on the Moon", *Nature*, v. 225, no. 5228, 10 January 1970, p. 117. "The latest report of the joint French-Soviet committee concerned with the cooperative space programme, agreed in principle in 1966, shows some changes of direction." "Most striking is a plan to land French laser reflectors on the Moon in 1970. A laser ranging experiment was carried on one of the first French national satellites, with pleasing results. No further details are available about the joint project, but clearly the experiment relies on a soft-landing mooncraft, presumably of the Luna lander type." "There is also a project for creating a radio-interferometer with the

Earth-Moon distance as a baseline. The first step is being taken by the radio observatory at Nancy, partly with the help of Soviet equipment." "It has also been decided to launch high altitude balloons in the Soviet Arctic this spring. It is not clear whether these will be the large floating physics laboratories or the constant pressure orbiting meteorological balloons that the French have pioneered in the southern hemisphere as an elegant method of obtaining continual surveillance of the high altitude weather."

BELGIUM

8012. "1968-72 Nuclear Programme", *Science Policy News*, v. 1, no. 4, January 1970, pp. 87-88. The Atomic Energy Commission of Belgium has published a general report on activities in the nuclear energy field during the period 1963-67. (Ministere des Affairs Economiques et de L'Energie Commissariat a L'Energie Atomique: L'Energie nucleaire en Belgique – Bilan des activities au cours de la periode 1963-1967, 1969, 154 pp.) This brief article summarizes some of the major aspects of the report, including the roles of the private and public sectors, business aspects, and the nuclear R&D programs. "Belgium, whose natural energy resources are diminishing, is becoming increasingly concerned with nuclear power. The private and public sectors have demonstrated their wish to pool efforts by drawing up a joint five-year nuclear programme for 1968-72." The public sector, under the Minister of Economic Affairs, consists of two bodies that are concerned with the development of basic and applied nuclear research: the Nuclear Research Centre (CEN) and the Inter-University Institute of Nuclear Science (ISSN). The private sector is made up of the nuclear energy industry's trade association, the Nuclear Foundation, several industrial consortia, and industrial firms. Research is financed almost entirely by the Government, and the funds allocated have continued to increase, rising to Frs. 1,500 million in 1967.

CANADA

8013. "Research Policy in Canada", *OECD Observer*, no. 44, February 1970, pp. 8-12. The problems of industrial research in Canada are analyzed and policy measures are suggested for enhancing its contribution to general economic aims. The article, prepared by the OECD Scientific Affairs Directorate, suggests that the rate of growth of industrial R&D is too slow, that the volume of effort is too small in absolute terms as well as in comparison with R&D done by Federal agencies, and that too much effort is devoted to fundamental and applied research at the expense of greater development activity. "The first aims of science policy in Canada are . . . to reorient the R and D effort, to reinforce industrial research and to link the work of the universities and government research centres more closely with the

country's economic and social goals." General steps toward these ends are suggested, including an outline of the major R&D programs that should be undertaken. As for the future, the authors foresee an increasing growth rate of federally-funded R&D, a "steep rise in R and D expenditure in the universities", a relative reduction of R&D by Federal agencies, and the reorientation of national R&D objectives to "extensive new programmes".

8014. Lukasiewicz, J., "A New Role for Canada: Warning Post Against Rampant Technology?", *Science Forum*, v. 3, no. 1, February 1970, pp. 3-8. The unique relationships between Canada and the U.S. are examined in terms of their implications for Canada's R&D policies. Canada, it is noted, has almost unrestricted access to the advanced technology developed in the U.S., because of geographical proximity, import/export relations, and the presence of U.S. industry in Canada. As a result, Canada "derives considerable benefit from this technology while paying only a small fraction of the R&D costs which are largely absorbed by the huge U.S. market". In view of these factors, the author suggests that Canadian R&D should be directed to "the use of advanced technology ... rather than with basic technological innovation". Such R&D could be concerned with technology "that enhances environmental and human values" or that improves industrial productivity; "the broad field of environmental and social impact of technology" is also suggested as an area for massive research. Beyond this, Canada can use the U.S. as an "early warning" system for detecting and dealing with the undesirable consequences of high technology.

8015. "New Thoughts on Canadian Research", *Nature*, v. 225, no. 5227, 3 January 1970, p. 10. The Science Council of Canada has published "the record of its opinion of, mostly dissent from, the report of the Macdonald Committee which ... advocated a far-reaching reorganization of the mechanism for government support of scientific and industrial research in Canada". The underlying tone of the Macdonald report was "decentralizing – it argued that there should be a new research council to support research in the humanities and that the responsibility of the National Research Council for laboratories should be separated from its responsibility for supporting university research". The Science Council "argues that the National Research Council should remain undivided ... but it is also anxious that the grant giving research councils should be encouraged to provide 'broad guidance' in the direction taken by university research". The Council places greater emphasis on "the importance of non-university establishments"; it also notes the uneven geographical distribution of research funds and suggests "a system of 'strategic development grants' aimed at developing centres of excellence". In addition, the Council advocates a system of university grants

including "individual project grants for the support of... 'little science', programme grants for supporting teams of people, major grants to get interdisciplinary projects or 'big science' launched, special grants for projects related to the development of Canada or of the university system and general purpose grants to help new developments".

8016. Poland, F., "New Science Body for Canada", *Science News*, v. 97, no. 5, 31 January 1970, p. 136. A new association of Canadian scientists and engineers has been formed "to help develop a better understanding in the Federal Government and among the general public of the important issues that relate science and technology with society". The objective of the new organization, called the National Association of the Scientific, Engineering and Technological Community of Canada (SCITEC), is "to marshal the scientific, engineering and technological community to provide leadership and to communicate, cooperate and work within itself with governments and the public in the national interest in those areas where it can make a competent contribution". "Providing independent advice to the Government will probably be SCITEC's most important role." It will "also be concerned with the interpretation of science to the public and the development of mutual understanding between the various scientific specialities". "SCITEC will have two parallel deliberative bodies. Its English-speaking Congress will have 200 members drawn from 60 existing federated science societies. Alongside it will be the 46-year-old assembly of L'Association Canadienne-Francaise pour L'Avancement des Sciences (ACFAS), which, although it will continue its long-established program, played a key role in setting up SCITEC."

8017. **"Proceedings of the Special Committee on Science Policy", The Senate of Canada, First Session, Twenty-eighth Parliament, Nos. 79-80, Queen's Printer and Controller of Stationery, Ottawa, Canada, 1969.** These proceedings contain briefs submitted to the Special Committee on Science Policy by various professional groups and individuals. The aim of the committee is to inquire into and report upon recent trends in R&D expenditures in Canada compared with those in other countries; R&D activities carried out by the government; federal assistance to R&D activities carried out by individuals, universities, industries, and others; and the broad principles, financial requirements, and structural organization of a "dynamic and efficient science policy for Canada". Included in these documents are briefs submitted by the Canadian Heart Foundation, Consumers' Association of Canada, Canadian Manufacturers' Association, Canadian Conference of University Schools on Nursing, Professional Institute of the Public Service of Canada, Canadian Psychological Association, various other institutes, foundations, and individuals.

CHINA

8018. Dean, G. C., "Science and the Thought of Chairman Mao", *New Scientist*, v. 45, no. 688, 12 February 1970, pp. 298-299. This article describes some of the unique characteristics of the Chinese efforts and policies to apply science and science-based technology to economic development. Unlike most underdeveloped nations which aim for a mixture of foreign and indigenous developed technology, Mao Tse-tung has been determined to "modernize China 'self-reliantly' . . . not only must China have its own capacity for research and development of new technology, but the technology itself must be uniquely Chinese, utilizing only Chinese-produced components, designed to meet the requirements of the Chinese production system". Relatedly, Mao rejects the validity or utility of basic research; instead, all scientific activities must be channeled into applied research and development. The linkage between this research and production is now being attempted at the personnel level rather than at the institutional level; the basic mechanism is the formation of teams of workers, technicians, and managers who combine research and production functions in one unit. "Mao's ultimate objective, however, is neither institutional reorganization nor the reform of scientific and technical personnel. It is the elimination of specialized technical roles altogether." To accomplish this, the education system is being reformed in such a way that the workers receive technical training. The author describes this approach of equipping the labor force with the requisite skills as "modernization from the bottom up", in contrast to the more typical tendency to promote scientific and technological change from the top down. "If Mao succeeds in equipping millions of Chinese peasants and industrial workers with some comprehension of twentieth century science and technology, he will have gone a long way toward breaking through the syndrome of underdevelopment."

FRANCE

8019. "France to Double Research Budget", *Nature*, v. 225, no. 5235, 28 February 1970, pp. 778-779. This article briefly previews France's Sixth Plan (1971-75) for R&D, which is now under review by government officials. Under the Plan, R&D expenditures are expected to rise from the present "2.2 per cent of gross home production (this criterion is now preferred to gross national product)" to 3 per cent by 1975; this means that expenditures "will increase by an average of 13 per cent every year to reach 32,500 million francs in 1975, which is about double the present figure. The proportion of this total supported by the state will stay more or less at 70 per cent. On the other hand, . . . expected development will particularly favour civil expenditures; military [R&D] will . . . grow in volume but will

remain stationary in relative terms." "In fundamental research the accent will be on the biological and social sciences, where the annual rate of growth will be about 23 per cent"; funds for chemistry and physics will grow at the rate of 15 per cent a year. In industrial R&D, the "grand and spectacular projects favoured by the previous government ... will be severely restrained"; the "purchase of foreign licences will be encouraged". Priority areas in the industrial component include housing, urban development and transportation, chemistry, metallurgy, mechanics, and electronics.

8020. "Research Expenditure in 1970 to 'Preserve Existing Programmes' ", *Science Policy News*, v. 1, no. 4, January 1970, pp. 89-90. "The [French] Government aims to spend 3 per cent of the GNP on research in 1975 (compared with 2.3 per cent in 1969 and 2.2 per cent in 1970)." "Operational expenditure under the research block vote as a whole rises from F. 1,425 million in 1969 to F. 1,510 million in 1970. Part of this increase is due to payments resulting from previous commitments, the new part of this budget amounting to F. 53 million which will allow of the creation of 335 scientific posts. All investments budgets ... have been reduced, though less so in the case of scientific research. Appropriations for programmed authorisations under the research block vote drop from F. 629 million in 1969 to F. 528.4 in 1970. Appropriations of the Delegation Generale a la Recherche Scientifique et Technique drop from F. 147 million in 1969 to F. 126 million in 1970 ... Programme authorisations of the CNRS are reduced to F. 144 million, as against 184 in 1969." Appropriations for atomic energy, space, and 'Plan Calcul' are also cited. In making these announcements, M. Ortoli, Minister for Industrial and Scientific Development, stressed that "generally French science policy remains unchanged" and that international cooperation is particularly important in regard to space research.

8021. "Change at the CEA?", *New Scientist*, v. 45, no. 683, 8 January 1970, pp. 44-45. "M. Francois-Xavier Ortoli, French Minister for scientific and industrial development, has set up a working party to report on the structure of the Commissariat a l'Energie Atomique and its relationships with both the French electricity authority and private firms concerned with the nuclear power industry. A re-examination of the purpose and structure of the CEA has been considered for some time and the recent switch in French policy on nuclear power stations ... has given new impetus to demands for change." With regard to CEA's future role, M Ortoli has said "the CEA must concern itself with a certain number of industrial techniques, in the fields of metallurgy, the chemical industry, etc. It must work in closer partnership with industry. It could become a sort of advanced technological centre for industry, but should always

560 firms covered not one stated that it had undertaken fundamental research, and only three claimed to undertake 'fundamental and applied' research."

JAPAN

8024. Boffey, P., "Japan (I): On the Threshold of an Age of Big Science?", *Science*, v. 167, no. 3914, 2 January 1970, pp. 31-35. The first of a series of three articles on the Japanese research establishment, this article discusses the relative strength of Japan's science and its initial ventures into the area of "big science". The general features of Japanese R&D are reviewed, including funding levels ($2.1 billion in 1968), government financing of R&D (about 30 per cent), research facilities, and the status of research in different fields. Following this, Japan's present and planned efforts in the areas of space, defense, and atomic energy are reviewed. The author points out that the Japanese "have particularly lagged in areas of 'big science that require substantial financing and strong leadership from the national government", and that further progress is being threatened by some formidable problems including "financial malnutrition"; a siege of disruptive student unrest; a "rigid organizational structure that inhibits mobility of researchers and discourages cooperative research efforts; a language barrier that deprives Japanese science of potentially fruitful contact with foreigners"; a "deep feeling of distrust that alienates much of the academic science community from the national government"; and a concern by some leaders that the Japanese lack creative ability. Despite these problems, "Japan's increasing commitment to 'big science' projects may ultimately have profound effects on the nation's entire research establishment".

8025. Boffey, P., "Japan (II): University Turmoil is Reflected in Research", *Science*, v. 167, no. 3915, 9 January 1970, pp. 147-152. This second article in a series on Japan's research establishment focuses on university science and the effects of student unrest on the university. Japan's university system is described, and the "organizational and social rigidities that seem to be *hampering* . . . academic research" are cited. As of 1967, there were 74 national universities, supported by the central government; 39 public universities, supported by other governmental entities; and 256 private universities, supported by student fees. The bulk of the fundamental research in Japan is performed at the universities while applied and developmental work is done by industry. Although the government has allocated more than half of its total R&D budget to university research, the amount is only about $320 million. But the "most serious problem currently confronting the universities" is student unrest, where issues have ranged from international politics to local campus conditions; some research efforts have been suspended and

laboratories closed as a result of student protest. "Japan's educational system is clearly in a state of transition – beset by enormous strains and trying to find a path toward reform."

8026. Boffey, P., "Japan (III): Industrial Research Struggles to Close the Gap", *Science*, v. 167, no. 3916, 16 January 1970, pp. 264-267. This third article of a series on Japan focuses on "industrial research and on certain common problems that are confronting all sectors of Japanese science". As in the U.S., industrial research is concentrated in a few large industries; "purpose-oriented", nonexploratory research predominates. It is estimated that Japanese industry devotes only about 1 percent of sales to R&D, as compared with 4.3 percent for the U.S. and 3.8 percent for France. Although Japan "has achieved the highest sustained real economic growth rate ever recorded by any great nation" – especially in the high-technology industries – the contribution of R&D to this growth is unknown. As for the common problems that confront all of Japan's science, the author cites "the lack of real strength in originality or creativity", the "unusually high barriers between the academic, industrial, and government research sectors", and the "language barrier". "Whether Japan will ultimately become a leading scientific power as well as a top-rank industrial power remains to be seen."

8027. "Fourth Member of the Space Club", *Nature*, v. 225, no. 5234, 21 February 1970, pp. 678-679. With its successful launching of a small satellite in February, Japan became the fourth member of the "space club". "Shortly before the ... launching, the national Space Development Committee announced a programme for eight satellites to be nationally launched in the next six years." "Further satellites for meteorological and navigational purposes are under consideration but have not yet been definitely adopted." "This year for the first time the Japanese Antarctic expedition will launch rockets from their mainland base in support of their polar research programme. Two geophysical rockets are due for launch this month; next season 12 rockets are intended to be launched." "The Japanese Meteorological Agency has also taken up rocketry for its advanced high altitude investigations"; the use of a new rocket range will come into use for this purpose in July, 1970.

NETHERLANDS

8028. "Summary, Interim Advice on Government Expenditure for Research and Development for the Period 1969-71", Science Policy Council of the Netherlands, 1969, 15 pp. This report summarizes the Interim Advice on government R&D expenditure prepared by the Science Policy Council, whose task is "to determine the priorities in the field of science and technology taking into account the relative

position of R&D with regard to other government objectives". The following national goals or "frames of reference" relevant to science policy are cited: moral and cultural standard of living, social living conditions, physical living conditions, economic potential, and position of the Netherlands in the international world. Estimated government R&D expenditures are given; for the period 1950-1966, government expenditure increased with an average of slightly over 22 percent per annum, from DFl. 22 million to DFl. 797 million. "The Council stresses that an average annual budgetary increase of 15 percent for government expenditure on R&D through 1971 will be essential." Government sponsored research is evaluated in the following 16 areas, or objectives, for which R&D funds are allocated: development aid, justice and police, education, defence, housing and building, physical planning, traffic and transport, water and flood management, industry and commerce, agriculture and fisheries, public health, social affairs and social welfare, arts and history, nuclear energy and nuclear physics, space research and technology, and promotion of scientific activities. (The report is available from the Science Policy Council of the Netherlands, Sweelinckstraat 8, The Hague.)

Current Science Policy Publications:

(1) Behandeling 'Wetenschapsbudget' (Minutes of proceedings of the "Science Budget"), Staatsuitgeverij, Handelingen II, 23rd September 1969, pp. 75-108, The Hague, 1969, 33 pp. Dfl. 1.76. Discussion about the "Science Budget", 1969, and the Interim Advice on Government Expenditure for Research and Development for the period 1969/71.

(2) Bosboom, P. H., Hoe komt een beleidsvisie tot stand? (Policy-making process), Stichting Toekomstbeeld der Techniek, The Hague, 1969, 11 pp. Dfl. 2.0.

(3) Science Policy Council, Diagram with explanatory notes on government-sponsored scientific and technological research in the Netherlands, The Hague, 1969, 11 pp.

(4) Nederlandse Organisatie Voor Zuiver-weten-schappelijk Onderzoek-ZWO, Jaaboek 1968 (Netherlands Organization for the Advancement of Pure Research – ZWO, Yearbook 1968), ZWO, The Hague, 1969, 143 pp.

(5) Met technologische munt betalen (Input and output of technical innovations), Tijdschrift voor efficient directiebeleid, vol. 39, 1969, no. 5, pp. 195-201.

(6) Nederlandse Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek TNO (Central Organization for Applied Scientific Research in the Netherlands TNO), Jaarverslag 1968 (Annual Report 1968), The Hague, 1969, 6 parts.
Part 1a: Central Organization TNO – General Information, 79 pp.
Part 1b: Central Organization TNO – Commissions and Institutes, 99 pp.
Part 2: Organization for Industrial Research TNO, 119 pp.
Part 3: Organization for Nutrition and Food Research TNO, 83 pp.
Part 4: National Defence Research Organization TNO, 52 pp.
Part 5: Organization for Health Research TNO, 155 pp.

(7) Netherlands Organization for the Advancement of Pure Research (ZWO), Current research in the Netherlands: biological and medical sciences, 1968, The Hague, 1969, 691 pp.

(8) Vervolg-interimadvies inzake de overheidsuitgaven voor onderzoek en ontwikkelingswerk; Rijksbegroting 1969, hfdst. VIII, nr. 50 (Interim Progress Report on Government Expenditure for R&D), The Hague, Staatsuitgeverij, 1969, 7 pp., Dfl. 0.45.

SWEDEN

Current Science Policy Publications:

(1) Gerholm, T. R., Forskningsresultats varde och forskningspolitisk organisation (The value of research result and the organization of research policy), TVF-Teknisk vetenskaplig forskning, 40, 1969, 3, pp. 78-98.

(2) Promemoria rorande svensk och europeisk rymdverksamhet avgiven av Arbetsgruppen foi rymdtecknik (Memorandum regarding Swedish and European space activities), Ministry of Industry (1969:3), Stockholm, 1969, 117 pp. plus app.

(3) Motives and qualifications of scientists and engineers emigrated from Sweden to the U.S.A., A preliminary report concerning a study made by the Committee on research economics, Sweden, assisted by the National Science Foundation, U.S.A. Committee on research economics at the Swedish Atomic Research Council and the Swedish Natural Science Research Council, Stockholm, 1969, 16 pp.

(4) Naturvetenskapernas roll i samhallsutvecklingen, FEK-meddelande nr. 40 (The role of science in the development of society, FEK

Report no. 40), Committee on research economics, Stockholm, 1969, appr. 47 pp.

UNITED KINGDOM

8029. "Wanted: A Science Policy", *New Scientist*, v. 45, no. 687, 5 February 1970, pp. 243. The need for "a consistent policy for science and technology", and the place of such a policy in the overall scope of government policy, is discussed with respect to the U.K. In the past, science policy "decisions have been taken on the basis of a mixture of political pressures, tradition, personal preferences, the example of what the U.S. has done, and just plain hunch". The formulation of national goals and the construction of a science policy around them "is now urgently needed". "Science has reached a stage at which scientific decisions are tantamount to decisions about our whole way of life." "Governments must come to realize that science policy is not just another policy, like those on housing, immigration or foreign relations. It demands a unique approach, one that reflects the integration of science into all areas of life and society." The first step toward this "is for the present government to catalyse a debate about what should be the social aims of science and technology, and then to construct their policy around these goals".

8030. "Dainton's Thoughts", *Nature*, v. 225, no. 5234, 21 February 1970, pp. 679-680. Dr. F. S. Dainton, who became chairman of the Council for Scientific Policy (CSP) on January 1, outlined some of his thoughts on issues confronting the council during the next few years and said "that he can see no reason for major changes in the workings of the committee in the near future". "One great problem that science policy faces at the moment . . . is a growing disillusionment with science, expressed in the attitude that science creates more problems than it solves. Such an attitude has grave consequences for future manpower resources, and can be reflected in the size of science budgets." Current CSP efforts and studies include "developing criteria for supporting scientific research in universities, international cooperation in science, especially molecular biology, the quantification of economic benefits of scientific research, and pollution". A study group has been established to look into problems created by expansion of higher education, including the question of "whether research facilities need to grow at the same rate as student numbers, and what effects such an expansion would have on the quality of research". In the area of international cooperation and exchange, CSP "is looking at the possibility of setting up international groups in existing laboratories, and is attempting to promote scientific exchange between European countries".

8031. "Conjuring Away the Rabbits", *Nature*, v. 225, no. 5229, 17 January 1970, pp. 209-210. Britain's Ministry of Technology has

issued a paper, "Industrial Research and Development in Government Laboratories", in which it proposes that "the laboratories of the Ministry of Technology engaged on civil research and development should be in the future managed by a public corporation, the British Research and Development Corporation". Chief components of the new organization would be the civil research establishments of the Atomic Energy Authority, the National Physical Laboratory, the National Engineering Laboratory, the Warren Spring Laboratory, the Hydraulics Research Station, the Forest Products Laboratory, and the National Research Development Corporation. This article describes the Ministry's arguments in support of the proposal and outlines some potential problems of implementation, including uncertainty as to funding arrangements, vagueness regarding the activities of the Corporation, and the probability that this "recipe for reorganization" will not be turned into legislation during the sessions of the present parliament. According to the article, "the best part of the package is the suggestion that there should be an intellectually independent organization with a powerful influence on the course of industrial research and development .... The most serious defect is that it is hard to see ... that the new arrangement will not be the same old pack of cards reshuffled."

8032. **"BRDC Proposal"**, *New Scientist*, v. 45, no. 685, 22 January 1970, p. 139. This article raises some unanswered questions concerning the proposed British Research and Development Corporation (BRDC). The proposal to combine the civil R&D laboratories of the Atomic Energy Authority and the Ministry of Technology "is another important step towards the aim of making science more useful to industry and to Britain at large". However, the article points out that such a large organization will be unwieldy and, because it will "incorporate some very disparate disciplines", there will be "clashes between the different factions". Yet to be determined are "the exact nature of the corporation, and the exact extent of its powers". "[W]hat is involved is a complete change of principle, ... the government's civil research programme will never be the same again." What is planned "is to make the government's industrial science a commercial commodity again, a commodity that is bought and sold on the open market, rather than one that exists as by right".

8033. **'Loose Edges in the Grand Design"**, *Nature*, v. 225, no. 5234, 21 February 1970, pp. 673-674. This article focuses on two apsects of the proposed British Research and Development Corporation (BRDC): (1) that too little discussion about it has been in public, and (2) that two parts of machinery of public science are "conspicuously absent from the green paper – the defence research establishments and the research associations". It is suggested that "there is a need for a unified organization for the research

associations – a framework within which advice, ideas and people could be more readily interchanged than is at present possible". With regard to the defence research establishments, the article questions whether, without their skill and special knowledge, "is there not a danger that the British Research and Development Corporation will be less well equipped than it should be to seize opportunities for which it is supposedly being created?" "The whole fabric of the new proposals rests on the assumption that it will be possible ... to increase enormously the amount of useful work which government laboratories can carry out for industry, and that it will be possible within the public service to find means by which a public corporation can take financial risks with public money. Those are the questions on which the soundness of the new proposals must ultimately depend."

8034. **"R&D in the British Business Enterprise Sector"**, *Science Policy News*, **v. 1, no. 4, January 1970, pp. 77-81.** The level and structure of R&D activities in the business enterprise sector of the United Kingdom are examined and compared with those of three other OECD countries of similar resources (France, Germany, and Japan) and with the United States. Data given include expenditures on R&D, expenditures as a percentage of GNP, percentage financed by the government, manpower employed in R&D, and amount of R&D performed by groups of industries – aerospace, electrical products, and chemical products. In terms of millions of pounds expended for R&D, the figures for each country are: United Kingdom – 606 million, Germany – 507 million, France – 423 million, Japan – 290 million, United States – 5550 million. The data indicate that R&D activities in the enterprise sector in France and Germany have been increasing and probably equal those in the UK. "In France much of the increase has been due to expanded public spending, whilst in the UK there has been a shift in emphasis from 'prestige' to 'industrial' R&D. Thus, in the UK the role of the aircraft industry has declined and in France it has increased. In Germany and Japan the R&D activities of the chemical industry are relatively more important." Overall, it appears that "the UK industrial R and D activities have reached a ceiling in terms of proportion of national resources ... whilst in Germany and France the share is below that in the UK and is still rising".

8035. **"Appointment of Royal Commission"**, *Nature*, **v. 225, no. 5235, 28 February 1970, pp. 780-781.** A Royal Commission on Environmental Pollution has been formed, with Sir Eric Ashby (Master of Clare College, Cambridge) as chairman. The Commission, which is responsible to the Secretary of State for Local Government and Regional Planning, is "intended to be permanent, and has been given terms of reference that charge it 'to advise on matters, both national

and international, concerning the pollution of the environment; on the adequacy of research in this field; and future possibility of danger to the environment' ". "The interpretation of these terms depends largely on the members of the commission, who will also be free to decide when and how to report, what priority to give to international rather than British problems, and what sort of research is to be assessed. Advisory machinery on environmental matters already exists in the form of bodies such as the Natural Environment Research Council, but because the commission has no executive powers it is expected to provide a more general view by taking into account the arguments of both polluters and conservationists".

Current Science Policy Publications:

(1) Ministry of Technology Report on Marine Science and Technology, Her Majesty's Stationery Office, London, April 1969, 60 pp., 5s. 6d. (Cmnd Paper 3992) (SBN 10 139920 0).

(2) Department of Education and Science and the British Council, Scientific Research in British Universities and Colleges 1968/69, Vol. I, Physical Sciences (SBN 11 270126 4), 636 pp., 65s., Vol. II, Biological Sciences (SBN 11 270127 2), 570 pp., 62s. 6d., Vol. III, Social Sciences (including Government Departments and other institutions) (SBN 11 270128 0), 476 pp., 60s., Her Majesty's Stationery Office, London, August 1969.

(3) Department of Education and Science, Science Policy Studies No. 4, an attempt to quantify the economic benefits of scientific research (by I.C.R. Byatt and A. V. Cohen), Her Majesty's Stationery Office, London, October 1969, 36 pp., illus., 4s. (SBN 11 270139 6).

(4) Science Research Council, Report of the Council for the year 1968/69, Her Majesty's Stationery Office, London, October 1969, 80 pp. illus., 8s 6d. (SBN 10 238369 3) (House of Commons Paper 383).

(5) Agricultural Research Council, Annual Report 1968/69, Her Majesty's Stationery Office, London, October 1969, 160 pp., 12s 6d. (SBN 10 241269 3) (House of Common Paper 412).

(6) Social Science Research Council, Annual Report 1968/69, Her Majesty's Stationery Office, London, November 1969, 224 pp., 17s. 6d. (SBN 10 200270 3) (House of Commons Paper 2).

(7) Medical Research Council, Annual Report April 1968/March 1969, Her Majesty's Stationery Office, London, July 1969, 318 pp., 28s. (SBN 10 229969 2) (House of Commons Paper 299).

(8) Science Research Council, An outline of SRC policy in relation to the Swann, Jones and Dainton reports, Her Majesty's Stationery Office, London, March 1969 (Cmnd Paper 3760 3417 3541).

(9) House of Commons Paper 213, Second Report from the Select Committee on Science and Technology, Defence Research, Report, Minutes of Evidence, Appendices and Index, Her Majesty's Stationery Office, London, May 1969, 680 pp. illus. 77s. 6d. (SBN 10 221369 0).

(10) House of Commons Paper 400, Third Report from the Select Committee on Science and Technology, The Natural Environment Research Council, Her Majesty's Stationery Office, London, July 1969, 244 pp. 28s. 6d. (SBN 10 240069 5).

(11) House of Commons Paper 401, Fourth Report from the Select Committee on Science and Technology, United Kingdom Nuclear Power Industry, Her Majesty's Stationery Office, London, July 1969, 268 pp. 30s. (SBN 10 249169 1).

(12) Science Research Council, Space Research in the United Kingdom, August 1967/July 1968, Available from the Royal Society, 125 pp., 13s. 6d., 1969.

WEST GERMANY

8036. **"Higher Education and Research in a Divided Germany"**, *Science Policy News*, v. 1, no. 4, January 1970, pp. 81-83. This article contains excerpts from a report on higher education and research in both parts of Germany, including data on number of students, government expenditures on education, and particular fields of study (e.g., biology, chemistry, physics, economics, and sociology). Conclusions based on the report include: (1) the staffs of the research and university institutes in Eastern Germany are of comparatively high quality; research institutes in the Federal Republic have a much greater variety of equipment; (2) contributions to progress in the natural and applied sciences are more numerous and extend over broader areas in the Federal Republic; research in Eastern Germany is of high quality and on a relatively broad front; (3) "research activity in the universities and academies of Eastern Germany is now being drastically re-oriented towards industrial production problems"; in the Federal Republic a large role is being given to basic research and independent establishments for applied research are being set up to bridge the gap between industrial research and production; (4) "the chief difference between the science and research systems in the two parts of Germany is the centralised planning, co-ordination and control of all scientific activity practiced in Eastern Germany".

Current Science Policy Publications:

(1) Stoltenberg, Gerhard, Staat und Wissenchaft. Zukunftsaufgaben der Wissenschaftsund Bildungspolitik (Government and Science. Future tasks of scientific and educational policy). Seewald Verlag Stuttgart, 1969, 85 pp.

(2) Stoltenberg, Gerhard, Mehr Offentlichkeit fur die Wissenschaft. Ein Interview mit Dr. Gerhard Stoltenberg. (More publicity for science. An interview given by Dr. Gerhard Stoltenberg). Stifterverband fur die Deutsche Wissenschaft, Essen-Bredeney, 1969. "Wirtschaft und Wissenschaft", No. 4, July/August, pp. 23, 24, 27.

(3) Stoltenberg, Gerhard, Ziele und Leistungen der Forschungspolitik. Zusammenfassende Darstellung des "Bundesbericht Forschung III" (Aims and achievements of science policy. Summary of the Third Report of the Federal Government on Research). Bundesminister fur wissenschaftliche Forschung, Bonn, 1969, 34 pp.

(4) Stoltenberg, Gerhard, Ziele und Wege rationaler Forschungsplanung. Schriftenreihe des Bundesministers fur wissenschaftliche Forschung. (Objectives and methods of effective research planning. Series published by the Federal Minister for Scientific Research). Bonn, 1969. "Research Policy", No. 9, 59 pp.

(5) Zierold, Kurt, Forschungforderung in drei Epochen. Deutsche Forschungsgemeinschaft. Beschichte, Arbeitsweise, Kommentar (Promotion of research during three epochs. The German Research Associations, its history and structure; comments). Franz Steiner Verlag, Wiesbaden, 1968. 638 pp.

(6) Wissenschaftsrat, Empfehlungen des Wissenschaftsrates zur Neuordnung von Forschung und Ausbildung im Bereich der Agrarwissenschaften (Recommendations by the Science Council concerning the re-organization of agricultural research and training). J.C.B. Mohr (Paul Siebeck), Tubingen, 1969, 247 pp.

(7) Echterhoff-Severitt, H., Wissenschaftsaufwendungen in der Bundesrepublik Deutschland. Foldge 4: Aufwendungen der Wirtschaft fur Forschung und Entwicklung in den Jahren 1948/49 bis 1968 (Expenditure on science in the Federal Republic of Germany. Series 4: Industry's expenditure on research and development from 1948/49 to 1968). Stifterverband fur die Deutsche Wissenschaft, Essen-Bredeney, 1969, pp. 19-22 in "Wirtschaft and Wissenschaft", No. 4, July/August.

(8) Schumacher, D., Systembetrachtung der staatlichen Aufwendungen fur Forschung und Entwicklung (Analysis of the system of government spending on research and development). Physik Verlag, Mosbach, 1969, pp. 363-366 in "Physikalische Blatter", No. 8, August.

(9) Scheuch, Erwin, Der Stellenwert der deutschen Wissenschaft in Europa under der Welt (The position of German science in Europe and in the world), Verlag Dr. Josef Raabe, Bonn, 1969, pp. 10-14 in "Die Deutsche Universitatszeitung vereinigt mit dem Hochschul-Dienst", Nos. 15/16, first and second August edition.

(10) Bestandsaufnahme und Gesamtprogramm fur die Meeresforschung in der Bundesrepublik Deutschland 1969-1973 (Stocktaking and overall programme for marine research in the Federal Republic of Germany 1969-1973), Bundesministerium fur wissenschaftliche Forschung, Bonn, 1969, 109 pp.

(11) Goeschel, Heinz, Die technologischen Entwicklungen and unsere Zukunft (Technological developments and their impact on our future), Stuttgart, Wissenschaftliche Verlagsgesellschaft m.b.H., 1969, pp. 847-862 in "Universitas", No. 8, August.

(12) Menke-Gluckert, Peter, Friedensstrategien, Wissenschaftliche Techniken beeinflussen die Politik (Peace strategies. The impact of scientific techniques on politics), Rowohlt Taschenbuch Verlag GmbH, Reinbek bei Hamburg, 1969, 299 pp.

(13) Bericht der Deutschen Forschungsgemeinschaft uber ihre Tatigkeit vom 1. Januar bis zum 31. Dezember 1968 (Report by the German Research Association on its activities from 1 January to 31 December 1968), Bad Godesberg, 1969, 498 pp.

(14) Jahrbuch der Max-Planck-Gesellschaft zur Forderung der Wissenschaften e. V. 1968 (Annual Report on the Max Planck Society for the Advancement of the Sciences, 1968), Munchen, 1968, 378 pp

U.S.S.R.

8037. "USSR Pushes Science Cities", *Scientific Research*, v. 4, no. 26, 22 December 1969, p. 13. The present and planned "science cities" in the Soviet Union are surveyed and discussed. "Five such centers already exist – combining the residential and recreational facilities of an ordinary town with all the facilities and equipment needed for scientific research – and some 15 others are being built or planned."

Recently announced were plans for five new centers to be located in various regions of the USSR; this "marks a victory for the sector of the Soviet science establishment that favors isolated science towns for research purposes, but there has been controversy . . . over how R&D should be organized". Critics of the "science city" idea "say it would cost less to build new science establishments in already existing cities". The principal science cities -- existing, in construction, and planned -- are briefly discussed.

8038. **"Another Academic Village"**, *Nature*, v. 225, no. 5235, 28 February 1970, p. 782. "A site in Siberia has been chosen, a few miles from Novosibirsk, for yet another in the series of 'Academic Villages.' The latest site is to comprise the new Siberian Centre of Agricultural Science and its associated institutes and living accommodation." The new Centre, organized by the "V. I. Lenin" All-Union Academy of Agricultural Sciences, will comprise five research foundations: the Institute of Agricultural Economics, the Institute of Mechanization and Electrificiation of Agriculture, the Siberian Scientific Research Institute of Stock-Breeding, the Institute of Chemical Applications, and the Institute of Animal Foodstuffs. 'The existing Siberian Scientific Research Institute of Stock-breeding will be developed here into a full-scale research and development institute. New Foundations will be the Institutes of Chemical Applications and Animal Foodstuffs".

PUBLICATIONS REGULARLY SCREENED FOR THE BULLETIN

Advancement of Science
American Behavioral Scientist
American Psychologist
American Scientist
Aviation Week & Space Technology
BioScience
Bulletin of the Atomic Scientists
Chemical and Engineering News
Congressional Record
Environment
Foreign Affairs
Fortune
Futures
Harvard Business Review
Impact of Science on Society
Industrial Research
Innovation
International Science Notes
Minerva
Monthly Catalog of Government Publications
Nature
New Scientist
News Report (NAS,NRC,NAE)
Physics Today
Public Administration Review
Saturday Review
Science
Science and Technology
Science Forum
Science Journal
Science News
Science Policy News
Scientific American
Scientific and Technical Reports (NASA)
Space/Aeronautics
Technology and Culture
Technology Review
The Center Magazine
The OECD Observer
The Public Interest
Transaction
U. S. Government Research and Development Reports
Washington Science Trends