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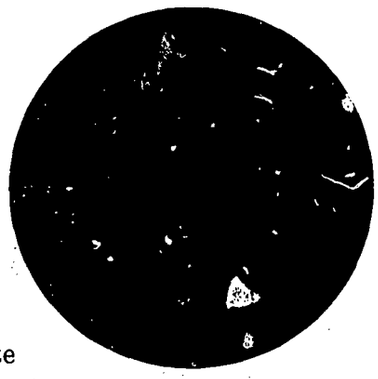
ABSTRACT

This bulletin is a bimonthly publication which reports the current national and international literature in the area of science and public policy. It is intended for individuals and organizations engaged in studying, formulating, or implementing public policy relating to science and its applications. The literature reported includes books, reports and periodical articles. 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 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 including (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. (PR)



Battelle Memorial Institute

Science Policy Bulletin

Volume 3 • Number 3 • June 1970
and
Volume 3 • Number 4 • August 1970

Science Policy 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 précis that briefly summarize the content of the cited literature. The précis are presented under one of a number of topical categories; cross-indexing is not used.

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The Bulletin is a bimonthly controlled circulation 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 Managing Editor, Science Policy Bulletin, Battelle Memorial Institute, 505 King Avenue, Columbus, Ohio, 43201.

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ABOUT THIS ISSUE –

Sixteen numbers ago (about October, 1967), Science Policy Bulletin made its debut. The first 16 issues reflected the fine hand of Editor Robert W. Brainard. With this issue, Bob terminates his association with the Bulletin, leaving Battelle to join the National Academy of Sciences. Joining the staff of the Bulletin with this issue is Eugene M. Simons.

Despite our best past efforts, our publication date has slipped and we are attempting by this double number to get back on schedule. It is our plan that Volume 3, Number 5 will appear early in November and that we will round out 1970 on target.

To those readers who returned our recent questionnaire, many thanks. We found, not surprisingly, that 25 percent of our readers had addresses which were incorrect in whole or in part. Hopefully, this issue of the Bulletin will reach each reader at his proper address. The response to our questionnaire may well be a world's record – 68 percent. Future editions will reflect some of the many well-conceived suggestions made by our readers. / CRT

1000 GENERAL

1023. *Science and Technology: Tools for Progress,* **The Report of the President's Task Force on Science Policy, U.S. Government Printing Office, April 1970, 48 pp.** The "principal conclusion" of the President's Task Force on Science Policy was that "this is a time of unusual need and unusual reward for Presidential leadership in bringing the tools of science and technology more effectively to bear on critical social, urban, and environmental problems, as part of a broader program to properly relate science policy to the Nation's goals and purposes". The report offered recommendations in seven major areas: (1) *national goals* – "the President [should] explicitly enunciate, as a national policy, the need for vigorous, high-quality science and technology, and call for – as one national goal – continuing leadership in science and in the technology relevant to our other national goals and purposes"; (2) *applications* – "Departments and Agencies [should] strengthen their capability to utilize science and technology effectively, in a broad-scale attack on social, urban, and environmental problems"; (3) *research support* – the Federal Government should work toward "effective... commitment to long-range research", "effective and uninterrupted support of graduate education", "improved utilization of the Federal laboratories", and "an improved process for establishing priorities for Federal support of science"; (4) *stimulating innovation* – steps should be taken to apply the power of the business enterprise system to society's needs; (5) *national security* – "The President [should] enunciate a national policy of increased emphasis on research and development for national security purposes – even at the expense of current military hardware procurement, if necessary"; (6) *international initiatives* – "Departments and Agencies [should be encouraged] to suggest specific new science-based foreign policy initiatives and opportunities for international cooperation"; and (7) *development of science policy* – "The President [should] direct his Science Advisor to develop a broadly based program for the continuing development of a national science policy." (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price: 35 cents.)

1024. Walsh, J., "DuBridge Reviews Major Science Policy Issues, Defends Administration Actions on Basic Research", *Science,* **v. 169, no. 3943, 24 July 1970, p. 357.** In a press interview in July, Presidential Science Advisor Lee A. DuBridge described the functions of the Office of Science and Technology (OST) and answered questions on major problems in federal science. He expressed concern over the effect of the "budget squeeze" on basic research, pointing out that Congressional cuts of budget requests for basic research, coupled with the Mansfield Amendment, nullified Administration

attempts "to give basic science special treatment". In discussing cuts in federal support of graduate students, DuBridge said that " 'a large number of highly trained people are out of jobs' ", and that "OST is involved in manpower studies that will enable policy makers to 'predict needs for technical manpower in a reasonable way' ". On national science policy, he indicated that the directions of technology promotion might be decided by cost-benefit analysis, "but that basic science should be supported separately." "He said his office is working on a policy statement on science which he hopes the President will eventually accept."

1025. **Mansfield, M., "Rechanneling the Public Resources for Basic Science through the Civilian Agencies: A New Goal for National Science Policy", *Congressional Record,* v. 116, no. 146, 21 August 1970, pp. S13932-S13934.** Testifying before the congressional Subcommittee on Science, Research, and Development, Senate majority leader Mike Mansfield explained his views on "the desirability of transferring the emphasis of the sponsorship [of basic research] from Defense to the civilian agencies". He pointed out that the Mansfield amendment (Section 203 of the FY 1970 military authorization bill, prohibiting DOD funding of research not directly relevant to military needs) was intended to be "neither anti-military nor anti-research", but to "lead to the transfer of resources from the Defense Department to the civilian agencies – primarily to the National Science Foundation". This, in turn, would effect a more logical balance among the agencies in determining the nation's science policy. Senator Mansfield lamented the fact that the federal budget for FY 1971 shows no such trend, and that the President's Office of Science and Technology has not provided the required interagency coordination. "We are in dire need of a new national policy on the federal role in science", he said. "It is up to Congress [under the leadership and stimulation of the Subcommittee on Science, Research, and Development] to set forth a national policy for science."

1026. **"Science No Longer an Opiate", *Nature,* v. 226, no. 5246, 16 May 1970, pp. 582-583.** Dr. Alexander King, Director-General for Scientific Affairs of the Organization for Economic Cooperation and Development, speaking before the Science of Science Foundation, discussed the increasing public antipathy toward science and intellectualism. Unchecked, such attitudes could deprive society of science and technology as a weapon for solving social problems. To prevent this, economic incentives for technological development must be replaced by goals aimed at improving the quality of life. Such a shift in priorities would require unprecedented cooperation among different disciplines, particularly from the social sciences, Dr. King said. He urged international cooperation in assessing the social, cultural, and economic consequences of proposed technological developments

as an aid to policy formulation. To overcome the unresponsiveness of the usual vertical government organization to the complex problems of establishing science policy within the provinces of an assortment of government agencies, Dr. King suggested that political structures be altered to include " 'a senior minister, placed close to the prime minister but without departmental portfolio, to develop integrative and longer term policies'."

1027. **"The Scientists Riposte"**, *Impact of Science on Society*, **v. XX, no. 2, Unesco, April-June 1970, pp. 111-169.** This issue contains the views of scientists on the societal effects of science and technology, and serves as a reply to an earlier issue of *Impact* (v. XIX, no. 4, 1969) entitled "Non-scientists Dissect Science". The articles and their authors include "Humility and Duty in Science, An Interview with Alfred Kastler" by Bruno Friedman; "Engineering in the Humanistic Tradition", by Harold A. Foecke; "Five Scientists View the Impact of Technology" – (1) "The Involvement of Scientists" by C. H. Waddington, (2) "Question Marks About People-Environment Relationships" by Norton Ginsburg, (3) "The Dangers in the Air" by Thomas F. Malone, (4) "Taking a Balanced View of Pesticides" by Kenneth Mellanby, and (5) "Environmental Problems and Family Planning" by J. S. Weiner; "Science in the Unity of Culture" by Miroslav Holub; and "Fragmentation in Science and in Society" by David Bohm.

1028. **Thiemann, H., "Changing Dynamics in Research and Development"**, *Science*, **v. 168, no. 3938, 19 June 1970, pp. 1427-1431.** This article examines the changing attitudes and conditions confronting the R&D community, discusses the resulting issues and problems, and proposes some measures for dealing with the new realities. The author suggests that a *crise de conscience* is now occurring with respect to science and technology in which its uses and priorities are open to question by society and the R&D community itself. He examines some of the dynamics and trends of the R&D community and points out that "a kind of redundancy" of capability now exists because of the failure to shift these R&D capabilities to new problem areas. He calls for a redirection of these capabilities, guided by national goals and problems and rationalized in a science policy. Beyond this, the author proposes the creation of an international science foundation to support research on global problems such as pollution, natural resources, and the atmosphere.

1029. **Gilpin, R., "Technological Strategies and National Purpose"**, *Science*, **v. 169, no. 3944, 31 July 1970, pp. 441-448.** "The technological revolution that has engulfed the industrial world is . . . requiring nations to develop conscious and systematic scientific and technological strategies." "A nation can follow one of three basic

strategies in response to the challenge of this new international economy"; these are (1) support scientific and technological development across the broadest front possible, (2) select and support scientific and technological specialization, and (3) import foreign technology by the purchase of licenses. "An analyses of the strategies followed by four countries – France, the United States, Sweden, and Japan – illustrates the alternatives and emphasizes the significance of choosing the correct strategy. The experience of these four countries also illustrates the effects of changing circumstances on national strategies. France and the United States are examples of countries that selected the broad-front strategy; the United States has found it rather successful, but for France it has proven to be a nearly unmitigated failure. Sweden exemplifies an exceptionally successful pursuit of the second strategy of specialization, and Japan has broken all economic records in perfecting the strategy of importing foreign technologies. However, contemporary developments are forcing changes; in Japan, for example, a shift to a strategy of innovative specialization and perhaps to the broad-front strategy can be discerned" It is concluded that a nation's technological strategy is perhaps the most important determinant in the success or failure of its domestic and international affairs.

1030. Mesthene, E. G., *Technological Change, Its Impact on Man and Society,* **Harvard Studies in Technology and Society, Harvard University Press, Cambridge, Mass., 1970, 127 pp. ($4.95).** How technological change induces social change and alters human values is discussed in this three-chapter book. In the first chapter, conflicting views of the value of technology, along with its opportunities and dangers, are pointed out. The negative effects (e.g., pollution, weapons proliferation, urban sprawl, encroachments on privacy) stem from freedom of individual decision making. The second chapter deals with the role of technology in altering values and consequently in influencing the choices made by individuals faced with options. The final chapter delves into the political consequences of social changes stemming from technological innovations. It concludes with a statement to the effect that to be successful in handling its technology, modern society must commit itself heavily to public goals and values at the expense of private objectives. An annotated bibliography of 65 references is included.

1031. Hetzler, S. A., *Technological Growth and Social Change,* **F. Praeger, New York, 1969, 294 pp. ($7.50).** "The failure of traditional concepts to explain a rapidly changing social world calls for a redirection of effort, for the opening of new avenues of inquiry." The author further states that "society is in the predicament of not understanding its most distinguishing feature, technological movement, and failing to understand it is unable to describe it, predict its

course, control it, or to distribute its benefits more evenly". This book represents such an attempt. Using the basic approach of "sociotechnics" (relationships between man and machine) throughout the book, the author presents a review of the social problems found in the transitional and the technologically advanced types of society; presents a critical evaluation of current development hypotheses in economics and in the social sciences; and, in the last half of the book, explores new hypotheses and ways in which they might be applied to produce technological advancement. He notes that, historically, technological growth has occurred in building-block stages (e.g., successive developments of man-machine organization, power technology, transportation technology, agricultural technology, and ultimately automation). Hetzler believes that "social change, technological advancement, and mechanization are, in a broad sense, synonymous". In fact, he concludes that "technology is essentially a set of social and physical relationships, or modes of interaction, between man and the mechanisms with which he works", and that it is "possible to prescribe planning principles which are applicable to the promotion of technological growth in the undeveloped and materially advancing countries alike".

1032. *The Management of Information and Knowledge,* **Panel on Science and Technology, Eleventh Meeting, Proceedings before the Committee on Science and Astronautics, U.S. House of Representatives, Ninety-first Congress, Second Session, no. 15, 27-29 January 1970, 237 pp.** The eleventh annual meeting of the Panel on Science and Technology of the House Committee on Science and Astronautics was devoted to the subject of management of information and knowledge. The Panel sought "to identify problem areas where legislative emphasis may be of benefit, and to explore the economic, individual, educational, and international implications" associated with the information explosion on modern-day and future societies. In addition to keynote addresses by McGeorge Bundy and Earl Warren, six papers were presented: (1) "Forces for Change in the 70's and 80's" – Herman Kahn; (2) "Managing Modern Complexity" – Stanford Beer; (3) "Self-Liquidating Ideals – Daniel Boorstin; (4) "The Individual: His Privacy, Self-Image and Obsolescence" – Paul Armer; (5) "Education in Information Systems" – George Kozmetsky; and (6) "Education in Post-Industrial America: Some Directions for Policy" – Thomas F. Green. (This report may be obtained from the U.S. Government Printing Office, Washington, D.C. 20402.)

1033. **Basiuk, V.,** *The Impact of Technology in the Next Decades,* **Reprint, Institute for the Study of Science in Human Affairs, Columbia University, Spring 1970, 42 pp.** "The unfolding of the new technology of the next twenty-five years and its enormous political

ramifications" are the subject of this article. The author discusses the "decline in the deterministic effect of resource location", "the integrative effect of technology", "global projection of influence through technology", "the growing scale and costs of technology", "technological impact of social discontinuities", "the growing importance of nonmilitary technology for national security", and "implications for American policy". In the discussion of policy implications, the author suggests two criteria for American policy: (1) "It is important that the United States be earnest and persistent in its efforts to subject technology and its impact to control in cooperation with other nations", and (2) "It is even more important that we as a society concentrate on improving our own capability in this regard". Basiuk suggests also that "aside from the need to strengthen our institutions [those controlling technology] there is also a need to re-examine our policies with regard to science and technology". Some specific policy issues and problems that are discussed briefly include determination of priorities, nonmilitary technology, and technological developments as an instrument of foreign policy. (This report can be obtained from The Institute for the Study of Science in Human Affairs, Columbia University, New York, N.Y. 10027.)

1034. **Gordon, T. J., and Ament, R. H., "Forecasts of Some Technological and Scientific Developments and Their Societal Consequences", Institute for the Future – Report R-6, Middletown, Connecticut, September 1969, 98 pp.** The findings of a study to forecast technological and scientific developments in the areas of biology and the physical sciences are presented; forecasts of the time of occurrence of events are assimilated into scenarios for the "technological world" of the years 1985, 2000, and 2025, by utilizing the Delphi technique. Experts in the respective fields were asked to forecast important technologies which they felt might occur in the next 50 years, to envision potential societal consequences of these developments, to judge whether these consequences might be desirable or undesirable, and, for a certain subset of technologies, to identify means by which the processes giving rise to the consequences could be manipulated. A listing is provided of "potential science-policy strategies which should be considered in the relatively near future if the image of society depicted by the forecasted technological developments appears likely and in need of change". (The report is one of six studies dealing with the development of advanced procedures for the long-range forecasting of technological and societal events prepared in 1969 by the Institute for the Future.)

1035. **Hertz, D. B., "The Technological Imperative – Social Implications of Professional Technology",** *The Annals of the American Academy of Political and Social Science,* **v. 389, May 1970, pp. 95-106.** "Engineers and technologists have always considered

themselves to be protagonists and leaders in man's struggle against nature. Each successful engineering project has been conceived as one more victory in the campaign to master the natural environment. By virtue of their successes, feeling has grown that there were no results that could not be achieved. But should man consider nature his enemy? If so, how can we win? Each time that technology has changed nature, there have been negative effects which had not been foreseen. These negative spillovers have rapidly multiplied the total environmental problem of the planet. It has now become clear that increasing population and changes in the rate of energy consumption are pushing toward a destructive total thermodynamic balance. If this change is not to be catastrophic, man will have to find a way to achieve an energy equilibrium. The technologist and engineer must be at the forefront of this search. For some reasonable expectation of success, a new approach will have to become part of technological problem-solving. This approach must involve technological assessments and evaluations that include much broader constraints than have been imposed in the past. The technological imperative calls for the reconstruction of engineering and technological curricula to include truly effective evaluation and assessment of proposed solutions to technological problems."

1036. Miller, A. S., "Science Challenges Law", *American Behavioral Scientist*, v. 13, no. 4, March/April 1970, pp. 584-593. "[This] exposition . . . is based on the . . . proposition that science means change and, further, that the law gives no guarantee that it is adequate to cope with the tensions emanating from a situation in which change 'is built into the very nature of [the] social system'." The author expounds on these hypotheses: (1) "science undermines the traditional juristic order"; (2) "science undermines the traditional political order"; (3) "the structure of government is being altered by science"; (4) "science has contributed substantially to the growth of the 'administrative state' "; (5) "science has the potential, and probably the actuality, of adverse effects on the human personality"; and (6) "science both exacerbates human problems and gives promise of their reasonable resolution". It is up to the legal profession (which has thus far failed) to change so that it can "meet the challenges of social change brought on by science and technology". "Heretofore, law has been used, with lawyers as willing servants, to further scientific change without regard to consequences . . ." ". . . legal education will have to become avowedly normative . . . A *pro bono publico* orientation for all segments of the profession is a necessity."

1037. Kash, D. E., and Weinstein, M. A., "The R and D Contract and Democratic Theory", *Policy Sciences*, v. 1, no. 1, Spring 1970, pp. 113-121. The Federal R&D policy of cost-plus contracting, initiated during World War II, is scrutinized by the authors in terms of

responsibility for "fulfilling goals efficiently, avoiding deleterious secondary consequences, and [preventing] abuses of power". Present R&D contracts call for the contractor to undertake something that no one knows how to do at the time the contract is let. He must thus do creative acts which can have unpredictable "spin-offs" and effects, both good and bad, on society. His R&D contract is "less an agreement to perform clearly defined tasks than it is a grant to create an indeterminate future". Experts are needed "to evaluate technically the effects of new techniques and projects on the environment". In addition, a measure of democratic control of R&D performance could be achieved by appointing review boards composed of laymen to examine critically *how* projects are being done and what their effects on society might be.

1038. Compton, W. D. (Ed.), *The Interaction of Science and Technology,* **University of Illinois Press, Urbana, Ill., 1969, 137 pp.** This volume contains eight papers presented at the Symposium on the Interaction of Science and Technology in which scientists from industry, government, and the university "examine the critical question of science-based social change in terms of developing improved interaction between the 'discipline-oriented' scientists and our 'mission-oriented' society". "The authors are specifically concerned with the extent of the connection between technological achievement and the findings of basic research, and how this connection may be strengthened. Some proposals include " 'coupling' or the creation of a milieu in which science can thrive coupled with an environment of technological awareness prepared to seek its ultimate exploitation; and 'problem-oriented' labs, where a balance is sought between relevant basic research, applied research, and engineering efforts, with 'evaluation centers' to compress and evaluate new knowledge." Authors and their topics are as follows: E. P. Price – "Science and Technology in Industry"; J. E. Goldman – "Science for Economic Growth and Social Change"; C. P. Sherwin – "The Coupling of the Scientific and Engineering Communities to Public Goals"; W. J. Price – "The Key Role of a Missioned-Oriented Agency's Scientific Research Activities"; M. Tanenbaum – "Relevance and Responsibility"; D. Alpert – "Applied Science and Engineering in the University"; G. E. Pake – "A University-Industry Joint Venture in Applied Science"; and W. K. Linvill – "Man, Technology, and Society".

1039. *Index to Literature on Science of Science,* **Research Survey and Planning Organization, CSIR, v. 5, nos. 11 and 12, November and December 1969, 32 pp.** This bibliography on the "science of science" covers recent (1969) literature on the topic as published in 37 journals, most of which are American and British. The briefly annotated bibliography of 178 items is divided into the following

categories: General, Agriculture, Computer, Defense, Education, Expenditure, Manpower, Policy, Foreign Collaboration, Organization, Economic Development, Industry, Management, and Trade. (The Index may be obtained from the Research Survey and Planning Organization, CSIR, Rafi Marg, New Delhi-1, India).

2000 SCIENCE, DOMESTIC PROBLEMS AND NATIONAL GOALS

2028. **"Nixon Details Pollution Superagency Plans"**, *Chemical and Engineering News*, **v. 48, no. 30, 20 July 1970, pp. 32, 37.** Formal proposals were submitted by President Nixon in July for an independent Environmental Protection Agency (EPA) and a National Oceanic and Atmospheric Administration (NOAA) with FY 1971 budgets of $1.4 billion and $270 million, respectively, under the Department of Commerce. The reporter states that "the President's proposals are assured of reasonably smooth sailing through Congress". "EPA chores include setting and enforcing standards; conducting research on . . . pollution; assisting others . . . to arrest pollution; and assisting the Council on Environmental Quality in developing and recommending new environmental policies." NOAA will absorb the following programs, most of which are currently outside the Department of Commerce: Environmental Science Services Administration, Bureau of Commercial Fisheries, Marine Minerals Technology, Marine Sports Fishing, Office of Sea Grant Programs (NSF), U.S. Lake Survey, National Oceanographic Data and Instrumentation Centers, and National Data Buoy Program.

2029. **Caldwell, L. K., "Authority and Responsibility for Environmental Administration"**, *The Annals of the American Academy of Political and Social Science*, **v. 389, May 1970, pp. 107-115.** "Authority and responsibility for ecologically sound policies for man-environment relationships are confused by the lag between the changing circumstances of man-on-earth and his assumptions, behavior patterns, and institutions. In the United States, many attitudes which were hitherto feasible have now become harmful. Sanctification of political forms and unrealistic appraisals of the tendencies of technological society severely handicap present efforts to cope with environmental problems. If society is to deal effectively with these problems, political and administrative leadership will be required to help the people to understand the necessity for certain changes in their expectations, laws, and public institutions. A new, ecologically valid politico-ethical ideology is needed to legitimize the tasks of public authority and responsibility that an effective effort to cope with man's environmental problems would require. A dual crisis of attitudinal and institutional inadequacy must be surmounted if the resulting crisis of the environment is to be overcome."

2030. **Lieber, H., "Public Administration and Environmental Quality"**, *Public Administration Review*, **v. XXX, no. 3, May/June 1970, pp. 277-286.** This article discusses various types of environmental problems and analyzes the failure to date of public administration to respond adequately to the crisis. It calls attention to the widespread

"backlash" which has sprung up against the environmental threats stemming from modern technology. Legislative and Executive responses are reviewed and the inadequacies of administrative theory detailed. Passage of the National Environmental Policy Act of 1969 (S 1075) specifying policy, goals, review of all federal programs for impact on environment, and a Council on Environmental Quality, is hailed as "the most significant recent legislative accomplishment". This law and many recent allied legislative proposals and executive actions show a strong intent to inject environmental considerations into federal programs; but, expectations are not being met. Funds appropriated for setting standards and controlling pollution are far below needs. Also, attempts by local agencies to deal with widespread pollution problems are meeting with clashes of political and economic interests. Three avenues of inquiry are suggested for arriving at suitable policies: (1) analyze and evaluate "the performance of existing agencies and arrangements"; (2) study "the innovative and status quo forces, in particular the role that interest groups have played in the establishment and administration of environmental programs"; and (3) consider "the use of legal tools in the struggle against environmental degradation".

2031. **"Senate Joint Resolution 207 – Introduction of a Joint Resolution to Establish a Joint Committee on the Environment"**, *Congressional Record,* **v. 116, no. 91, 4 June 1970, pp. S8352-S8356.** Senate Joint Resolution 207, backed by at least 33 senators, was introduced in the Senate to supersede Senate Resolution 78 and establish in the Congress "a forum for the assessment of present and future problems affecting man and his environment". The "Joint Committee on the Environment", created by S. J. Res. 207, would be composed of 11 members from each house of Congress and would have three major functions: (1) to conduct comprehensive studies of the extent and consequences of environmental and technological changes, (2) to study methods of maintaining "conditions under which man and nature can exist in harmony" on a continuing basis, and (3) to develop policies that would encourage maximum private investment as a means of improving the quality of the environment. "The joint committee would have no jurisdiction over legislation or powers of legislative oversight." This is left to the various standing committees of both the House and the Senate having jurisdiction over matters relating to the environment. S. J. Res. 207 calls for representation on the joint committee from these standing legislative committees. The information and analysis evolved by the joint committee is intended to provide background, guidance, and intelligence on environmental matters not only to the standing committees, but also to all of Congress, "to the executive branch, to scholars and academic institutions, to professional organizations, to state and local governments, and to the public at large".

2032. Fling, K. J., "Project Eagle, A Systems Approach to the Environment", *BioScience*, v. 20, no. 9, 1 May 1970, p. 565. Project Eagle is proposed as "the initial phase of the interdisciplinary, inter-institutional research and development needed at national and regional levels to attack the problem of environmental rehabilitation". According to this article, "Project Eagle will be funded and managed by a National Trust for the Environment, . . . supported monetarily by American industry and directed by both public and private sector scientists . . ." Pushed by a group of systems and environmental scientists at various universities, Project Eagle is visualized as employing 20 to 100 staff members from diverse backgrounds in each of 70 to 100 centers with annual budgets of $1 million to $2 million each. Their functions would be to implement systems-oriented solutions to problems of society.

2033. Carpenter, R. A., "Information for Decisions in Environmental Policy", *Science*, v. 168, no. 3937, 12 June 1970, pp. 1316-1322. Contained in this article is a discussion of environmental policy considerations, current issues, and an overview of information sources and mechanisms used by Congress in the formulation of environmental policy. "A challenge to the development of a coherent policy is the perspective from which an issue is approached." Three "identifiable" approaches are (1) traditional, or market-place economics, (2) protecting human health and increasing life span, and (3) ecology. The conflicts of interests on environmental matters "can be mitigated if it can be shown that a highly productive environment is also a high quality environment". Major issues which have come before the Congress are grouped under these ten headings: "policy analysis", "environmental programs", "pollution – air, water, and solid waste", "agriculture", "urban conservation", "international implications", "minerals, fuels, forests, and range", "wildlife and fisheries, recreation, parks, and esthetic values", "electric power", and "population". The criticality of environmental issues, conflicts in existing laws, and conflicts in perspectives cause information service to assume unusual importance in guiding legislative decisions. Channels of information for the 24 congressional committees (these are listed) with a direct interest in environmental issues include the public committee hearing, lobbies, professional staff assistants, constituents, technical professional societies, ad hoc specialists and advisory groups, and the Environmental Policy Division of the Legislative Reference Service.

2034. "Man and Pollution vs. Air and Water", *Technology Review*, v. 72, no. 8, June 1970, pp. 73-74. A major study analyzing scientific, technological economic, social, and policy aspects of pollution in the atmosphere-ocean system will be conducted during the summer of 1970, under M.I.T. auspices through grants (over $250,000) from

federal agencies and private foundations. The Steering Committee chaired by Carroll L. Wilson, Professor of Management at M.I.T., has drawn together more than 50 experts from the fields of meteorology, physical chemistry, oceanography, biology, ecology, engineering, economics, political science, and law. "Their purpose will be a three-stage approach to atmospheric-ocean pollution: (1) to analyze and synthesize present knowledge of pollutants and their effects, (2) to prepare a detailed outline of new research, monitoring, and other work needed to determine critical unknowns about long-term effects and controls, and (3) to study economic and social costs of various alternatives to alleviate pollution, identifying agencies and groups that are available and/or needed to implement the work." The study "will lead to several stages of general and detailed reports".

2035. Jackson, H. M., **"What Congress Must Now Do to Save the Environment"**, *Smithsonian,* **v. 1, no. 2, May 1970, pp. 14, 16.** Sen. Henry Jackson discusses in this article a wide range of federal legislation that he feels is necessary to implement the "National Environmental Policy Act". "The next logical step . . . is to develop a national land-use policy." Suggested legislation in this area includes (1) "A 'Surface Mining Act' to regulate those industries that strip the mineral wealth from the land . . ."; (2) "A 'National Open Beaches Act' to preserve for public use more than the present five percent of the nation's 21,724 miles of recreation shore line"; (3) "A 'Federal Surplus Land for Parks and Recreation Act' to make idle lands available for public use at little or no cost to local communities"; (4) "Legislation to set aside additional national park and wilderness areas before they are lost to industrial, commercial or residential development", and (5) "Amendments to the Land and Water Conservation Fund to provide increased monies for state and federal acquisition of recreational lands". Legislation will be required in other areas for the purpose of (1) developing new cities to aid in creating a population balance; (2) developing a national transportation policy that considers environmental values; (3) up-dating of mining, right-of-way, and other public land laws; (4) developing an overall national energy policy; (5) developing new procedures to allow for the widest possible public participation in decision-making, and (6) enlarging the role of the U.S. in cooperative international efforts in the administration of the world's environment.

2036. Cohn, V., **"But Who Will Pay the Piper and Will It Be In Time?"** *Smithsonian,* **v. 1, no. 2, May 1970, pp. 15, 17-21.** Some observations are offered in this article as to why a "true start" has not been taken toward cleaning up the environment, along with some suggestions as to where to begin, how, and by whom. "If we would really keep a clean planet, we must first decide what kind of society we want." A place to begin is to enact the programs proposed by the

administration, enforce those laws already in existence, establish federal standards, assure federal coordination and control, develop a new set of tax policies at all levels, and "be prepared to pay a heavy price". More knowledge is needed to answer many of the most basic questions about the environment; much of this knowledge could come from R&D in such areas as "advance examination of our massive assaults on the limited earth", waste-disposal systems, ecological transport systems, land use, and planned towns including experimental cities. "These need R&D programs on a scale not yet even considered -- perhaps under something like a reconverted NASA with a new national goal: to put men on a clean earth in this decade." This means social and economic engineering and severe tax laws, if necessary.

2037. *Policies for Solid Waste Management,* **Prepared by the Ad Hoc Committee on Solid Waste Management, NAE-NAS, Public Health Service Publication no. 2018, 1970, 64 pp.** This report "attempts to outline an action program based on problem definition, a study of need, a study of constraints, and an analysis of engineering requirements and alternatives". Institutional activities of the present and the recent past are discussed, along with an evaluation of the recommendations made in the report: *Waste Management and Control* (Federal Council for Science and Technology, NAS-NRC Publication 1400, 1966, 257 pp.). Three major recommendations made by the Committee were that (1) "there be established a solid waste management information center . . ."; (2) "research, development, and large- or full-scale demonstrations on solid waste systems and components be carried out . . . in metropolitan areas . . ."; and (3) "there be substantial efforts to improve system business management, planning, and manpower training" that would include coordination among different levels of government and private enterprise. Minimum levels of funding for implementation of each recommendation are suggested for the years 1970-1974. A selected bibliography is included as an appendix. (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price 50 cents.)

2038. **"Alaska Pipeline Halted", *BioScience,* v. 20, no. 9, 1 May 1970, p. 566.** Complaints filed jointly by three conservation groups prevented the issuance of a haul-road permit for the construction of the $1 billion Trans-Alaska Pipeline System (TAPS) to move oil to the southern coast, according to this news item. A separate permit for the pipeline right-of-way was already being held up because of detrimental effects the 180°F oil might have on "the delicate Alaskan ecology and especially on the permafrost -- the frozen layer of gravel, sand, and ice . . ." This delaying action stemmed from a report by a special task force named by the President to monitor TAPS' plans for environmental dangers.

2039. "NSF Sponsors Alaskan Pipeline Study", *Science,* v. 168, no. 3937, 12 June 1970, p. 1323. "The National Science Foundation has announced that it will sponsor an urgent study of the ecological effects of the trans-Alaskan pipeline and of accelerated development of Alaska's North Slope. A team of scientists from seven institutions will investigate the permafrost, plants and animals, and snow cover of the area; the team will also install a test section of a heated pipeline, similar to the real pipeline. The study will last 1 year, and will cost $300,000."

2040. "COPE Holds First National Meeting", *Chemical and Engineering News,* v. 48, no. 26, 22 July 1970, pp. 34, 39. A thumbnail description of proceedings at the first national 5-day convention of the Congress on Optimum Population and Environment (COPE) is given in this article. At one of the plenary sessions, temporary chairman W. Willard Wirtz, ex-Secretary of Labor, told the 1200 delegates from the 250 diverse groups represented of his two goals for COPE: to identify the interrelationships among constituent groups, and to foster mutual support for the recognition and solving of problems. Reports by 12 different topic groups are to be incorporated in an overall proceedings report. The heterogeneous recommendations include establishment of a National Service Corps for defense of the environment as an alternative to military service, a guaranteed income, a national health insurance plan, reorientation of medical education, federal monitoring of the environment, a nonmilitary analysis of national defense requirements, and dozens of others. "Political maneuvering and unrestrained rhetoric . . . left many delegates to COPE's first meeting uneasy about the organization's future as an effective coalescor of environmental action".

2041. *Environment: The Quest for Quality,* Mobilizing Science, Industry and Government, 18-20 February 1970, International Biological Program, 26 pp. This document is a condensation of the proceedings of a conference sponsored by the U.S. National Committee for the International Biological program and the Public Affairs Council, directed toward mobilizing science, industry, and government to solve the environmental crises. Highlights are presented from the various presentations: open remarks by Philip Handler, President of the National Academy of Sciences; keynote address by Robert H. Finch, Secretary of Health, Education, and Welfare; comments by prominent businessmen, educators, legislators, agency heads and other speakers at the joint sessions; and reports summarizing discussions by each of three distinguished panels on "What can be done to solve the environmental crisis?" Some recommendations by the panel on *industry's role* are that industry should (1) join the government to promote, not obstruct, mandatory controls on its own pollution; (2) contribute a small percentage of its capital expansion funds to insure that its

expansion is compatible with environmental needs; (3) support the creation of new political mechanisms to control pollution. From the panel on *government's role* came suggestions that government should (1) coordinate research among industry, the universities, and government; (2) inform and educate the public on environmental matters; (3) set up a joint congressional committee on the environment and an independent environmental executive agency analogous to NASA or AEC; (4) work with other countries to set up a cooperative program for attacking environmental problems together. The panel on *science's role* recommended that (1) educators teach and motivate scientists to think beyond narrow disciplines in a realistic way; (2) scientists become more involved in politics and government; (3) ecosystem baseline studies and multidisciplinary environmental team studies be carried out on the impact of technology on man and the environment; (4) the academic community enhance its communication with industry and government to implement across-the-board efforts toward environmental control. (For sale by the Public Affairs Council, 1601 18th Street, N.W., Washington, D.C. 20009. Price: $1.00.)

2042. *Universities, National Laboratories, and Man's Environment,* **Division of Technical Information, U.S. Atomic Energy Commission, November 1969, 167 pp.** This document is the proceedings of the AUA (Argonne Universities Association, a consortium of 30 universities) Conference held 27-29 July 1969 for the purpose of answering the question: "What can universities and national laboratories together do to help in solving environmental problems?" Speakers and their topics include: "Social Problems and Natural Sciences" by Rene Dubos; "The Earthly Environment – Can Universities and National Laboratories Help Man Survive in It?" by Elvis J. Stahr; "The Role of Universities and National Laboratories in the Solution of Social Problems" by Melvin Price; "The Environmental Quality Council and the Citizens' Advisory Committee on Environmental Quality" by John L. Buckley; "Radiation Protection – Past, Present, and Future" by James T. Ramey; "Founding of the Cleaner Air Committee" by Laura Fermi; "A Balanced Approach to the Problem of Environmental Pollution" by Chet Holifield; "Six Impossible Things Before Breakfast: New Organizations for Environmental Research" by Henry S. Rowen; "The Role of the University in Problem Solving" by Fred H. Harrington; and "Automobiles and Air Pollution" by Lawrence R. Hafstad. The majority of the conference attendees gave a qualified endorsement to the establishment of the "Socio-Technological Research Organization" as an "appropriate step" for the AUA and the Argonne Laboratory to take in order to martial their resources and capabilities for improving the environment. (This report is available as CONF-690705 for $3.00 from Clearinghouse for Federal scientific and Technical Information,

National Bureau of Standards, U.S. Department of Commerce, Springfield, Virginia 22151.)

2043. *Science and Technology and Its Application to the Problems of Pollution, Transportation and Employment,* **Proceedings of Western States Conference, 9-11 March 1970, Salt Lake City, Utah, sponsored by the Federation of Rocky Mountain States, Inc., the Western Governors Conference, the National Science Foundation, and the Four Corners Regional Commission, 138 pp.** This report contains the proceedings of the Western States Conference on Science and Technology which addressed itself to two major questions: (1) "How can we satisfy our present human needs and the needs of a hundred million more people thirty years from now, at the same time providing for a quality environment?" and (2) "Are we going to be able to apply science and technology in a meaningful way to the solution of our social problems in a political environment?" The proceedings contains presentations of several national leaders and specialists, and a report summary of eight discussion groups. Among the recommendations by the discussion groups were these: (1) establish an "Office of Scientific Advisor to the Governor of the State", (2) develop a new type of "interface institution" which would organize full- and part-time university faculty members to work on current problems, (3) inform and educate all sectors of society through various media including an "environmental program" for students from grade school through college, (4) update the present governmental system, especially with respect to the necessity for new and improved regional arrangements essential in dealing with identified problem areas, and (5) establish a scientific-technological information service for state legislators and other officials.

2044. **"Legal Control of the Environment",** *PLI News,* **v. 7, no. 76, 23 September 1970, 4 pp.** This is an announcement of a 2-day seminar on Legal Control of the Environment cosponsored by Practising Law Institute and Southern Methodist Law School to be held at Las Vegas (13-14 October), Dallas (17-18 November), New York (14-15 December), and Atlanta (7-8 January). Subjects to be covered by presentations and panel discussions are Sources of Environmental Law, Federal Statutory Law, Litigation in the Courts, and Administrative Agencies. (Information is available from Practising Law Institute, 1133 Avenue of the Americas, New York, N.Y. 10036.)

2045. **"Bibliographic Materials on Environmental Affairs", International Survey on Environmental Policies, July 1970, 40 pp.** This is a selective, annotated compilation of literature covering primarily policy issues related to the quality of the global environment. Part A lists books, articles, reports, and documents; Part B describes 41 pertinent bibliographies and reading lists; and Part C enumerates 118

periodicals and newsletters dealing with the environment. (The document is available from the Anderson Foundation, 600 Fifth Ave., New York, N.Y. 10020.)

2046. **"Population Commission"**, *Science,* **v. 168, no. 3931, 1 May 1970, p. 557.** "The President has signed a bill establishing a Commission on Population Growth and the National Future. The Commission will be composed of two Senators from different parties, two Representatives from different parties, and up to 20 others named by the President, who will designate the chairman. The Commission will study the probable course of population growth between now and the year 2000; inquire into the public resources required to deal with the anticipated growth; and determine the ways in which population growth may affect the activities of government. It will have 2 years to complete its work."

2047. **Lamson, R. J., "Federal Action for Population Policy – What More Can We Do Now?"**, *BioScience,* **v. 20, no. 15, pp. 854-857.** "The federal government can, immediately, with existing authority and resources, take many actions in the areas of research, planning, and operations to cope with our critical domestic population problem . . ." Research monies should be devoted to an analysis of the effects of alternative trends in population growth and distribution on the success and cost of federal programs and national goals; to determination of how implementation of alternative growth rates would affect environmental quality; and, to an analysis of incentives for using "more efficient" birth control methods. In addition to research, the need is "to increase quickly public discussion of the population problem and of the goals and means to cope with it". This could be accomplished if (1) the Bureau of the Budget would make sure that all federal agencies plan for a range of alternative demographic futures, (2) all legislation for some resource or service were to include population growth considerations, (3) all planning, programming, and budgeting studies in the Federal Government were to include considerations for population growth, distribution, and control, and (4) public information programs of affected agencies were adapted to convey to the public the interaction among (a) alternative population growth rates, (b) family size, and (c) the ability of the agency to continue to solve the problems which it is chartered to solve. Lack of foresight and prompt action now "increases the likelihood that we will limit our population through some combination of manipulation, repression, war, famine, and disease" in the future.

2048. *Technology and the City,* **Research Review no. 5, Harvard University Program on Technology and Society, Cambridge, Massachusetts, 1960, 53 pp.** This report deals with "the impact of technological

change on the American city". To provide an appreciation of the literature in this particular area, "lengthy abstracts of a small number of carefully selected books and articles are presented, preceded by a brief state-of-the-art essay and by summary statements covering each subcategory of titles". The topics selected for review are the technology-city relationship, housing, transportation, planning and new towns, and urban information systems and the systems approach. (For sale by the Harvard University Press, 79 Garden Street, Cambridge, Massachusetts 02138, Price: $2.00.)

2049. **"A New Institute on Medicine Will Examine National Policy Problems in Health Care"**, *News Report,* **National Academy of Sciences, National Research Council, National Academy of Engineering, v. XX, no. 6, June-July 1970, pp. 1-2.** "The National Academy of Sciences' Board on Medicine . . . will become the nucleus of a new Institute on Medicine, which will address major national policy questions in the field of medicine and health care." Institute membership is expected to grow from the 21-member nucleus to approximately 200. Members, who will serve for fixed terms, will be chosen from medical education, medical practice, biomedical research, nursing, public health, and such related fields as law, economics, political science, and other social and behavioral sciences. In announcing the establishment of the institute, Dr. Philip Handler, President of the Academy, said: "The experience of the Board on Medicine has demonstrated the feasibility of constructively dealing with complex policy questions related to medicine and health care by bringing together practitioners of medicine and thoughtful individuals from diverse fields associated with public affairs. The decision to create an Institute on Medicine reflects the conviction of the Council of the Academy that these questions will increase in number and complexity and that they deserve the highest priority. We look to the new institute to provide the imagination and knowledgeable concern that will be required to address these problems effectively in the national interest."

2050. *Proceedings of the Advisory Panel Meeting on the Program for the Eastern Regional Conference on Science and Technology for Public Programs, April 2-3, 1970,* **The New England Economic Research Foundation, Cambridge, Mass., 21 October 1969, 35 pp.** This report is a transcribed dialogue among members of the Advisory Panel during a meeting held for the purpose of planning an Eastern Regional Conference on Science and Technology for Public Programs. Some of the topics discussed relevant to the effective use of science and technology by state and local governments are (1) the merits of altering organizational structure vs. concentrating on policy for effective program management, (2) education of leaders on the importance of science and technology, (3) advanced management

systems that would include utilization of existing technology to meet urban needs on a multijurisdictional scale, (4) central and adaptive research institutions analogous to those which have evolved in agriculture, (5) public corporations, (6) the need for ways to evaluate the performance of public institutions, (7) the role of the university in translating basic research results into action programs, (8) how science and technology came to be used in the Federal Government, and (9) ecological considerations.

2051. *The Environment and the Action in Technology Transfer 1970-1980,* **Report of a Conference Sponsored by Denver Research Institute, University of Denver, 26-28 September 1969.** This report provides a summary and overview of a conference devoted to the subject of technology transfer. Several sessions were structured around the interests and needs of technology suppliers and users of technology. Attention was devoted to what "the conferees generally agreed was the most significant target for technological transfusion — the urban scene". Six major conclusions of the conference were (1) "further development of transfer systems should focus more on people than on hardware", (2) "refining, packaging, and selling of technology should receive more attention", (3) "past attention to technology transfer has focused on supply side; future attention should focus on demand side and on differences among user groups", (4) "motivations for transfer need to be enhanced, particularly in the public sector", (5) "the value of selected technologies for solving societal problems should be endorsed by high level leadership", and (6) "the environment for technology transfer should be created or modified through education and reward mechanisms". (This report may be obtained from the Denver Research Institute, University of Denver, Denver, Colorado 80210.)

2052. *Project for the Analysis of Technology Transfer,* **1969 Annual Report, Denver Research Institute, University of Denver, March 1970, 50 pp.** Technology transfers resulting from NASA programs are discussed in this report prepared by the Project for the Analysis of Technology Transfer (PATT). "The results of 1969 PATT activities fall into three categories: (1) findings and hypotheses of a general nature resulting from an overview of NASA technology utilization activities; (2) findings related to the effectiveness of the Tech-Brief Technical Support Package (TSP) program; (3) findings from special studies of other Technology Utilization activities." "An estimate of $3 to $4 million in annual cost savings from technology transfer accomplished through TSP's . . . can be coupled with two hypotheses . . . (1) there is a tendency for many private corporations to minimize and/or to be unaware of the technological benefits they may have received from Federal agencies, and (2) the impacts of technology transfers resulting from NASA's Tech Brief-Technical

Support Package Program are a small proportion of the total impacts of transfers resulting from all of NASA's activities." A user evaluation of a NASA Regional Dissemination Center, examination of the NASA Biomedical Application Team program, and a study of users of Gemini and Apollo photography are also included in this analysis. (The report may be obtained from the Denver Research Institute, University of Denver, Denver, Colorado 80210.)

2053. **Brinckloe, E. D., and Matlack, W. F.,** *The University-Related Science Institute as a Technology Transfer Agency,* **N70-25218, Graduate School of Public and International Affairs, University of Pittsburgh, 3 October 1969, 20 pp.** "The university store of basic science and knowledge, constantly being replenished by new academic work, constitutes a primary source of intellectual capital to spark innovations in our society. Some linkage between university and community is essential if this capital is to be tapped effectively. The university can provide the linkage in-house (it makes little practical difference whether as a separate corporation owned by the university, or as an integral department or laboratory on campus), but two difficulties arise: one is the growing university distaste for applications work within the academic organization; the other is the existence of such conflicting views as to the type of outside work a university should accept." The private "university science center", operated by faculty members, funded privately, but subject to informal university control is discussed as a "middle ground" method of circumventing such objections. (This report can be obtained from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151.)

2054. **"Urban Systems Engineering Demonstration Program, a New Approach", U.S. Department of Housing and Urban Development brochure HUD-35-MD, November 1969, 1 p.** This brochure describes a Federal grant program "to utilize systems engineering, analysis techniques, and computer technology in establishing economic and efficient public service facilities and services" in such areas as sanitary sewage, storm drainage, solid waste management, water, and public safety. "Eligible applicants include public bodies or a combination of public entities . . . authorized to plan areawide systems of public facilities or services. Direct grants may be used to finance up to two-thirds of the total cost of an Urban Systems Engineering Demonstration project." (Detailed information is available from the Office of the Assistant Secretary for Metropolitan Development, U.S. Department of Housing and Urban Development, Washington, D.C. 20410, or from any HUD Regional Office.)

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3019. "Industrial R&D Spending, 1968", *Science Resources Studies Highlights,* **National Science Foundation, NSF 70-12, 25 May 1970, 4 pp.** This report contains preliminary results and analysis of a survey of industrial R&D spending for 1968. Included in the report are comparisons of amounts spent in different years by government and by industry for basic R&D and applied R&D in selected industries and selected product fields. Also compared are the numbers of scientists and engineers in selected industries. Industrial R&D spending for 1968 totaled $17.4 billion ($8.9 billion, or slightly over half, from company funds; the remainder from Federal funds) – a 6 percent increase over 1967. "Between 1958 and 1964, company and federal funds showed annual average rates of growth of 9.1 percent and 7.7 percent, respectively. During the 1964-68 period, however, companies' own funds rose at an annual rate of 11.3 percent, while Federal support went up only 2.6 percent." Five industries accounted for 83 percent of the total expenditures: aircraft and missiles, $5.7 billion; electrical equipment and communication, $4.0 billion; chemical and allied products, $1.6 billion; machinery, $1.6 billion; and motor vehicles and other transportation equipment, $1.5 billion. "Basic research accounted for $642 million, applied research, $3.1 billion, and development, $13.7 billion." The product group registering the largest percent gain between 1959 and 1968 was professional and scientific instruments; spending on this area increased from $191 million to $698 million. "In January 1969, industrial firms reported employment of 386,100 full-time equivalent R&D scientists and engineers, an increase of 2.5 percent over January 1968." (Full results of this survey will be published in the report *Research and Development in Industry, 1968,* scheduled to become available later this year from the U.S. Government Printing Office.)

3020. "Research and Development in State Government Agencies, FY 1967 and 1968", *Science Resource Studies Highlights,* **National Science Foundation, NSF 70-13, 1 June 1970, 4 pp.** "State agencies [excluding State universities and colleges] in all 50 states expended $136 million in fiscal year 1967 and $159 million in fiscal year 1968 for research, development, and supporting R&D plant according to a recently completed NSF survey." Of these funds the Federal share was nearly one-half. "The expenditures reported in this survey represent an average annual increase of 20 percent since 1964 . . . when R&D expenditures of all 50 states were $77 million. The federally supported share of these expenditures has risen . . . at an annual rate of 26 percent, while the share provided by the states rose at an annual rate of 15 percent . . . In both 1967 and 1968, over 40

percent of total State expenditures for research and development went to the area of health and hospitals and 25 percent for natural resources; approximately 15 percent went for highway research and development. Other areas receiving R&D support by States were education (10 percent), agriculture (2 percent), police protection and correction (2 percent), and public welfare (1 percent)." Over 80 percent of the R&D work was performed by the State agencies themselves, with the remainder being contracted out. A total of 3,733 full-time-equivalent scientists and engineers was reported for the $127 million of R&D work performed intramurally in 1968, along with 5,403 support personnel. Breakdowns in spending by purpose, type of research, and state are given in tabular form. (Full results of this survey will be published in the report *Research and Development in State Government Agencies, Fiscal Years 1967 and 1968,* scheduled to become available later this year from the U.S. Government Printing Office.)

3021. Boffey, P. M., "Recession in Science: Ex-Advisors Warn of Long-Term Effects", *Science,* v. 168, no. 3931, 1 May 1970, pp. 555-557. This article reports on the testimony of four former presidential science advisors (James K. Killian, Jr., George K. Kistiakowsky, Jerome B. Wiesner, and Donald F. Hornig) before the Senate subcommittee on the National Science Foundation (NSF). "The burden of their testimony was that a variety of actions by the Nixon Administration, the Congress, and various funding agencies have combined to jeopardize the orderly growth of American science." Wiesner "warned that if budget stringencies of the past four years continue, then the 'technological and scientific lead of the United States will not exist in a decade' ". The following factors were cited as "undermining the effective conduct of research": "an effective decline in the level of federal support for R&D in recent years; abrupt changes in federal student aid programs; the impact of inflation; the impact of the Mansfield amendment . . .; and a tendency for other mission agencies to abandon basic research". The effects of the "sharp drop in federal support of graduate students" is also discussed along with the arguments for and against such support. "The actual amount that Congress grants NSF will be determined by the two appropriation committees, which have not yet been heard from, but the budget boosts recommended . . . by the House authorizing committee reflect a feeling that NSF, in a period of declining science budgets, must assume a more central role in preserving the scientific establishment.' "

3022. "Cutbacks Beget Mediocre Science", *Industrial Research,* v. 12, no. 6, June 1970, pp. 43-44. This article discusses the effects of reduced funding of basic research as viewed by leaders of the U.S. scientific community in attendance at recent meetings of the National

Academy of Sciences and the American Physical Society. The prevailing mood of these meetings was that support of basic research is not likely to improve as some had thought and in fact "the picture has continued to blacken". Disciplines mentioned as being most affected were physics, radio astronomy, and high-energy physics. Physical organic chemistry was also alleged to be "in sorry straits", a situation which could "cripple U.S. competency both in industrial chemistry and combating environmental pollution". A comprehensive federal policy on science support was called for which would include an Administration decision "to give science support at a steady level which can be relied on for a reasonable period of time". Presidential Science Advisor Lee DuBridge "bowed to criticism that the nation lacks a science policy by declaring 'the policy of the Nixon Administration is balancing the budget.'" William D. McElroy, director of the National Science Foundation, "while conceding the present difficulties of science stem from the economic squeeze rather than any anti-scientific trend ... asserted that even the classically nonmission-oriented agencies, such as the NSF, now must become more involved in the society that pays for their research".

3023. **"Senator Allott Addresses Federal Council for Science and Technology's Committee on Federal Laboratories"**, *Congressional Record,* **v. 116, no. 74, 11 May 1970, pp. S6950-S6951.** In this address, Senator Allott discusses some of the factors influencing Federal support of R&D. Regarding the fear that the U.S. is about to incur a "research gap" of its own making, he states that we must distinguish between "arguments for heavy R&D spending that are based on serious long-term projections of national needs and arguments that rely excessively on national vanity". In the face of the large fraction of the FY 1971 Federal budget (80 percent) committed to uncontrollables and national defense, coupled with the erosion of real R&D support as a result of inflation, the scientific community "has a moral responsibility" to reexamine its own priorities and to limit fund requests, contends Senator Allott. He recommends "establishing a Joint Congressional Committee on Science and Technology ..., an Office of Technology Assessment for the Congress ..., [and] scientist advisors on the staffs of all relevant Congressional committees".

3024. **"Daddario and Kennedy Recommend Boosts in NSF Budget"**, *Physics Today,* **v. 23, no. 6, June 1970, pp. 61-62.** Both the House and the Senate recommended that the FY 1971 appropriation to the National Science Foundation (NSF) be higher than the $513 million Administration request. This article discusses the logic behind the $27.6 million increase asked by the House Committee on Science and Astronautics and the even greater increase ($50 million) called for in a bill introduced by Senator Edward M. Kennedy. The arguments generally revolve around the desirability of the NSF picking up part

of the $60 million worth of academic science projects being dropped by other agencies because of budget cuts and the Mansfield amendment. In testimony before Kennedy's Special Subcommittee on the NSF of the Senate Labor and Public Welfare Committee, NSF Director, William D. McElroy, indirectly reaffirmed the need for augmented financing by detailing some of next year's NSF aims. He said that "NSF is 'formalizing and developing the short-range relevant [to current problems of society] research, while continuing support of the long-range of basic research'.". The following week, all four former presidential science advisers appeared together before the same subcommittee and endorsed the proposed $50 million budget boost.

3025. "NSF Authorization Bill", *Science*, v. 169, no. 3943, 24 July 1970, p. 355. "Congress has sent to President Nixon a $537.7 million authorization bill for the present fiscal year for the National Science Foundation (NSF). The bill, which sets a maximum on the amount which may be appropriated for NSF, exceeds the President's budget request by $26.7 million. The largest addition by Congress was $20 million for academic science projects transferred to NSF from mission agencies. The appropriations bill for NSF is currently in a House-Senate Conference."

3026. Kennedy, E. F., "Health Budget Crisis – Need for Increased Funds", *Congressional Record*, v. 116, no. 99, 16 June 1970, pp. S9116-S9119. Senator Kennedy, in testifying before the Labor-HEW Appropriations Subcommittee, pointed out that "one of the most critical aspects of the current Federal budget is the inadequate level of appropriations requested by the administration for Federal health programs. The situation is especially critical in the area of health manpower, but increased appropriations are also urgently needed in the areas of health research and health services". His speech compared the Administration's 1971 budget requests to the "need" and reviewed the spending policies with regard to dollars appropriated in several major health programs for fiscal years 1969 and 1970. Some highlights follow. *Health Services*: for mental health, the 1971 request ($346.6 million) is $14 million less than was appropriated last year; for community health centers, $80 million was authorized by P.L. 91-211, but no funding was recommended by the Administration; for the Migrant Health Program and Regional Medical Program, the Administration requested the same funding as last year in spite of alleged increased needs. *Health Research*: "because of inflation, the Administration's budget request [of $1.032 billion for NIH research for FY 1971] is the equivalent of imposing a 10% cut on research funds". *Health Manpower*: for institutional grants to medical and dental schools, $168 million is authorized by law, but the Administration requested only $113 million; for institutional grants to schools of nursing, $40 million is authorized, but the request is for

only $11 million; for construction grants to medical and dental schools, $225 million is authorized, but the request is for $118 million; for construction grants to schools of nursing, $35 million is authorized, but the request is for $8 million. *Student Loans*: $21 million was authorized, but only $9.6 million is requested. Further comparisons are provided in two appendixes: (1) "Levelling-Off of Health Research Appropriations – 12 Year Comparison" and (2) "Comparison of Health Appropriations, Fiscal Years 1969-71".

3027. "NIH: Marston's Budget", *Chemical and Engineering News*, v. 28, no. 27, 29 June 1970, p. 11. "The fiscal year 1971 budget requests of $1.04 billion for the National Institutes of Health include more money for research in cancer, heart and lung diseases, family planning, and environmental health. However, some research areas, such as the general medical sciences, are being cut back." This budget request is about 6 percent higher than the 1970 request, barely compensating for inflation. NIH Director Robert Q. Marston indicated that there is a shortage of manpower for medical research and that "though the number of applicants to the nation's 105 medical schools has increased of late, more are still needed . . . to reduce U.S. reliance on foreign-trained physicians".

3028. "NIH Traineeships Abandoned", *Nature*, v. 227, no. 5256, 25 July 1970, pp. 329-330. The National Institutes of Health (NIH) are planning to discontinue the granting of predoctoral fellowships to individuals, though training grants to institutions will continue to support about 5000 predoctoral workers per year. This decision is partly for budgetary reasons; but it was influenced by the NIH belief that institutions can do a fairer job of assessing candidates. A similar decision on the part of the National Science Foundation (NSF) to abandon its traineeships in 1971 is unrelated to the NIH move. The NSF is also discontinuing block grants of traineeships to graduate schools considered capable of attracting good students. It will, however, maintain a program of fellowships competed for by graduate students on a national basis.

3029. "Accelerator Reprieved?", *Nature*, v. 226, no. 5252, 27 June 1970, p. 1196. "The possibility of a reprieve for the high energy physics laboratory operated jointly by Princeton University and the University of Pennsylvania has been raised in the past few weeks by the Nuclear Science Board of the AEC and by the director of the laboratory, Dr. Thomas White. The laboratory was one of the most spectacular casualties of the United States budget for the coming financial year in that no allowance at all was made for its support, costing between $4.5 and $5 million a year. The accelerator is a new facility which cost $40 million to build. It now appears that the laboratory could be operated at a reduced level at a cost of about $2

million a year, and that the total cost to the federal government would amount only to $1 million a year. Those responsible for advising both the AEC and the administration are in these circumstances now urging that there should be provision for the accelerator. It is known that the most serious difficulty to be overcome before this can be attempted is that the administration feels bound by a statement attributed personally to President Nixon that the laboratory would be shut down. Although intended as a proof of the administration's determination to economize, this statement has now also been invested with too much solemnity for it to be discarded easily."

3030. Boercker, F. D., Harmon, L. R., and Kelly, W. C., "Employment Status of Recent Recipients of the Doctorate", *Science,* v. 168, no. 3934, 22 May 1970, pp. 930-939. The results of surveys conducted by the National Research Council's Office of Scientific Personnel, as presented in this article, belie reports of growing unemployment and underutilization among Ph.D.'s in the natural and social sciences, mathematics, and engineering. In fact, questionnaires covering 25,787 1968 and 1969 Ph.D. recipients completed by 2330 heads of academic doctoral departments indicate that virtually all of the Ph.D.'s in science and engineering found employment relevant to their training. According to the NRC, the pessimistic reports stem from the fact that there has indeed been a shift from a seller's to a buyer's market, allowing recruiters to relax their efforts and causing worried students to send out multiple applications. Some figures from the surveys of the 1968 and 1969 Ph.D.'s are (1) about 7 percent were foreign nationals who left the U.S.; (2) the number accepting temporary postdoctoral employment rose from 11.0 percent in 1968 to 17.7 percent in 1969; (3) about 2.3 percent entered the military service; (4) those accepting jobs irrelevant to their training amounted to only 0.4 percent in 1968 and 0.7 percent in 1969; and (5) unemployed were 0.7 percent in 1968 and 1.1 percent in 1969 (slightly inflated by some people who were not seeking employment).

3031. "Science/Engineering Manpower: Surplus or Shortage?", *Washington Science Trends,* v. XXVI, no. 4, 4 May 1970, pp. 19-21. Reduced spending by the DOD, NASA, and the AEC is decreasing the job opportunities in basic research and "glamour" industries. Because new-employment reductions in the aerospace, electronics, metal products, and manufacturing industries are expected to be almost offset by increases in engineer hirings by governments, utilities, construction firms, and consulting firms, hiring of engineers in 1970 should be only about 1 percent below 1969. Enrollments in engineering schools are down, particularly in draft-affected graduate schools. Charles E. Falk, the National Science Foundation Planning Director, indicates that the supply and demand of science and

engineering Ph.D.'s "has moved from an acute shortage situation to one which might be termed rough equilibrium". Jobs are available, but the Ph.D.'s have to look harder to find them. The 350,000 science doctorates predicted by NSF for 1980 (compared with 150,000 in 1968) will not create a "Ph.D. glut", but many will have to work in nonacademic, non-R&D fields that still contribute significantly to scientific, economic, and social progress, according to Falk. The biomedical field, until recently unscathed, is also feeling the pinch of Federal cutbacks, despite a shortage of trained personnel. Some information sources on the scientific manpower situation are (1) *Some Preliminary Indications from the 1970 Engineering Manpower Commission Survey* of the Demand for Engineers (available from Engineering Manpower Commission, 348 E. 47th Street, N.Y.C. 10017); (2) *Science and Engineering Doctorate Supply and Utilization 1968-1980* (prepared by Charles E. Falk, Planning Director, NSF, Washington, D.C. 20550); and (3) *American Science Manpower, 1968, NSF 69-38.* Statistical study (available through NSF channels or at $2 from Supt. Doc., USGPO, Washington, D.C. 20550).

3032. **Gruner, W. R., "Why is there a Job Shortage?", *Physics Today*, v. 23, no. 6, June 1970, pp. 21-26.** In this article, the Acting Deputy Director of the Division of Mathematical and Physical Sciences for the National Science Foundation analyzes and extrapolates the demand for Ph.D. physicists from 1968 through 1973. He concludes that this period will produce at least a few hundred (and perhaps over 1,000) more new physics Ph.D.'s than will be needed for teaching and in traditional roles in industry and government. This surplus will not be unemployed, he predicts. Physics Ph.D.'s must use their talents in new ways that are "responsive to the current preoccupations of society". If we overreact by reducing the supply of physics Ph.D.'s by several hundred per year, "a sellers' market might conceivably recur by the late 1970's".

3033. **Southwick, T. P., "Brain Drain: Fewer Scientists Enter U.S., More Seek to Leave", *Science*, v. 169, no. 3945, 7 August 1970, pp. 565-566.** "There are strong indications that . . . increasing numbers of scientists, both foreign-born and American, are going abroad to work. At the same time, new changes in the immigration laws have stemmed the flow of foreign scientists coming into the United States." This article attributes the exodus of scientists to two main factors: an upswing in R&D activity abroad (notably in Europe and Japan), and a deterioration in support for scientific projects in the U.S. Also cited are social and political considerations by foreign scientists who came to the U.S. in the mid-1960's and became disenchanted because of urban problems, inflation, Vietnam, politics, and the prospect of raising children in this climate. The apparent brain-drain reversal was discussed by the subcommittee on Science,

Research and Development of the House committee on Science and Astronautics during recent hearings on the need for a uniform national science policy in the U.S.

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4035. *Manned Space Flight, Present and Future,* **Staff Study for the Subcommittee on NASA Oversight of the Committee on Science and Astronautics, U.S. House of Representatives, 12 February 1970, 391** pp. This study, prepared by the committee staff, presents "a spectrum of views of NASA and the aerospace industry focused on the current declining condition of manned space flight effort and future alternatives". The study is divided into two parts which "review current manned space programs and future possible effort attempting to highlight significant issues and alternatives for manned space flight". Summaries of conferences held with NASA and aerospace contractors on these topics constitute the bulk of the study. A short conclusions section points up the need for early decisions and the possible consequences of further delays. Overall, it is concluded that "without major decisions on a manned space flight program the United States will possess no manned space flight capability beyond 1974". (The report can be obtained from the U.S. Government Printing Office, Washington, D.C. 20402.)

4036. *Space Program Benefits,* **Hearing before the Committee on Aeronautical and Space Sciences, U.S. Senate, 6 April 1970, 379 pp.** The purpose of this hearing was to review and assess the benefits of the national space program. The proceedings consist largely of testimony by NASA's Administrator, Dr. T. O. Paine, on such topics as the impact of the space program on society, technology, meteorology, communications, and management; the science program; and NASA's technology transfer program. Attachments to Dr. Paine's statement include appendixes dealing with the technology utilization program, scientific and technical publications, impact of the space program on education, university research facilities, public interest in the space program, and the NASA reliability and quality assurance program. (The report can be obtained from the U.S. Government Printing Office, Washington, D.C. 20402.)

4037. **Normyle, W. J., "Shuttle Runout Set at $14 Billion",** *Aviation Week & Space Technology,* **v. 92, no. 23, 8 June 1970, pp. 16-17.** According to this article, NASA plans to ask for $225 million for FY 1972 as part of a $6 billion, 5-year R&D program "leading to the first planned test flight of the two-stage, fully reusable [manned space] shuttle system . . . Total runout cost . . ., including missions that would carry operational payloads, is about $14 billion over the next two decades". McDonnell Douglas and North American Rockwell have each been awarded an $8 million, 11-month contract for design and system definition studies, while Grumman is slated to get $5 million for studies of alternative space shuttle proposals.

European space agencies are being urged "to participate to the fullest extent possible . . ." On the basis of present schedules for awarding contracts, "initial operational capability of the system, using both stages as fully reusable vehicles, would be in late 1978".

4038. **"Independent Offices and Department of Housing and Urban Development Appropriation Bill, 1971 – Amendment No. 745",** *Congressional Record,* **v. 116, no. 108, 29 June 1970, pp. S10057-S10058.** Senator Mondale proposed an amendment to the NASA appropriation bill which would "prohibit the use of any part of the NASA appropriation for design and definition of the space shuttle/station". ". . . the amendment reduces the appropriation for research and development by $110 million, the amount requested by NASA for design and definition of the shuttle and station . . . NASA's preliminary cost estimates for development of the space shuttle/station totals almost $14 billion, and the ultimate costs may run much higher. Furthermore, the shuttle and station are the first essential steps toward a manned Mars landing – a program which would cost anywhere between $50 to $100 billion . . . Congress must reexamine the premises of our entire space program. In particular, before appropriating funds for development of this space shuttle/station – which will create a commitment to costly manned space operations – we must first determine whether man can even survive long-duration flights. At that time, we can then decide whether this Nation is willing to bear the burden of the enormous costs required for such an ambitious manned space effort." With this amendment, the NASA appropriation for 1971 would be reduced to $2,496,100,000.

4039. **Normyle, W. J., "Splits Emerge on Space Shuttle Priorities",** *Aviation Week and Space Technology,* **v. 93, no. 4, 27 July 1970, p. 17.** Problems facing the U.S. space shuttle program, as revealed at a three-day meeting attended by over 1000 U.S. and foreign participants, are described. "There is a clear division of support for which portion of the system [booster or orbiter] should be given highest priority, and a lack of definitive justification for the evolution of a program with a projected . . . cost of $14 billion." Differences were brought out in debates over choices of "such basics as design configuration, materials, integrated avionics, operations and crew systems . . . The lack of resolution among the participants . . . led to a decision to hold another conference in about nine months." Hopefully, present study contracts (see Abstract 4037) will have resolved some key uncertainties by then. Exclusive of primary propulsion system studies, supporting research for the space shuttle system was budgeted at $29.5 million for FY 1970; $66.7 million is proposed for FY 1971, possibly augmented by funds diverted from other NASA programs (e.g., from nuclear propulsion work involving the Nerva system).

4040. Normyle, W. J., "Major Decisions on Space Near", *Aviation Week & Space Technology,* **v. 93, no. 7, 17 August 1970, pp. 14-15.** Because its FY 1972 budget promises to be the lowest since 1962, NASA is considering deleting two of the six remaining manned lunar landing missions (Apollo 15 and 19). The $200 million or so saved would be diverted to developing the space transportation system for earth orbital activities — NASA's newest project. This possibility is being evaluated by the National Academy of Sciences' Space Science Board and NASA's advisory board on lunar and planetary missions, at the request of NASA Administrator, Thomas O. Paine. "Scientists had been looking forward in particular to the use of the lunar roving vehicles and elimination of even one such mission would be a disappointment". Apollo 15 is not scheduled to carry a rover. The cancellations "would provide the launch vehicles that could be used to orbit an intermediate space station to help observe the 200th anniversary of the U.S. Declaration of Independence in 1976".

4041. "Reviewing Space Priorities", *Science News,* **v. 98, no. 5, 1 August 1970, p. 93.** A review of NASA's scientific programs by the National Academy of Sciences (NAS) is expected to influence NASA's space flight activities toward exploratory objectives, as contrasted to the operational goals to date. This article is related to the NAS life sciences review, requested by resigning NASA Administrator Dr. Thomas O. Paine, " 'because we have not been satisfied with the direction or accomplishments of our bioscience programs' . . ." An orbiting laboratory, Skylab, is already scheduled for extensive biomedical experiments on or by the astronauts and biological studies on pocket mice, human tissue, vinegar flies, and potatoes. However, any extended biological and medical research activities will be influenced by NAS recommendations and by available resources of both money and people.

4042. "NASA Seeks Earth Resources Experiments", *Washington Science Trends,* **v. XXIV, no. 16, 27 July 1970, p. 92.** Proposals are being sought by NASA for experiments to be run in 1972 and 1973 using the Earth Resources Technology Satellite (ERTS), a modified version of the Nimbus weather satellite equipped with a TV system and radiometric scanner to be developed by General Electric. "Foreign nations and scientists are being actively invited to participate in the program, both to widen the scope of coverage and to overcome any potential 'spy-in-the-sky' objections." Possible uses for ERTS are "remote identification of agricultural species; observing changes in vegetation areas; assessing crop vigor and stress; classifying land use; determining land surface composition and structure; mapping of snow cover and assessing runoff characteristics; mapping shorelines and estuaries and identifying and mapping air and marine pollution".

4043. **"The Next Decade in Space"**, *A Report of the Space Science and Technology Panel of the President's Science Advisory Committee,* **March 1970, 63 pp.** New goals for U.S. space activities for the 1970's are summarized by the President's Science Advisory Committee, on the basis of findings by a Space Task Group formed by the President. These include (1) "Contribute to . . . economic strength and security . . . through an expanded program of earth-oriented [space] research . . ."; (2) "Explore the solar system, with emphasis on . . . lunar exploration, the search for extraterrestrial life and . . . planetary exploration"; (3) "Use . . . space platforms . . . to expand our knowledge of the universe and basic physical laws . . ."; (4) "Develop new technology . . . [to] expand capability for automated equipment . . ., reduce the cost of access to and operations in space . . ., [and] study . . . a reusable space transportation system"; (5) "Strengthen the biomedical basis for . . . long duration manned space flights"; and (6) "Encourage international cooperative [space] programs". The report of the Panel concludes that these "recommended programs can be conducted with a budget which is approximately comparable . . .to the rate of spending during the past few years". (For sale by the U.S. Government Printing Office, Washington, D.C. 20402. Price: 65 cents.)

4044. **"House Funds SST in Close Vote"**, *Aviation Week and Space Technology,* **v. 92, no. 22, 1 June 1970, pp. 26-27.** Strong opposition to the Administration's recommended $290-million FY 1971 appropriation for the Boeing supersonic transport prototype was evidenced by the slim House margin (only 14 votes) in favor of retaining it in the $7 billion transportation budget. "Opponents . . . introduced portions of a March, 1969, Transportation Dept. document discussing the government's right to terminate the program for default as evidence of serious problems in meeting contract specifications . . . Transportation Dept. engineers declared that most of the problems described in the report had been overcome and that reduced performance parameters . . . would be acceptable . . ." However, Transportation Dept. officials are seeking "assurances from Boeing and General Electric that the companies could overcome a projected $76 million cost overrun and four-month schedule delay" (first-flight date of March 1973 instead of November 1972).

4045. **"Pressure Mounts on SST Program"**, *Washington Science Trends,* **v. XXIV, no. 9, 8 June 1970, p. 47.** "The pressure on Congress and the Administration over the supersonic transport (SST) program is mounting rapidly in Washington, following a narrow House victory on proposals to fund two prototypes . . . . The U.S. aerospace industry has been buffeted by defense changes and cutbacks. Exports, which play a major role in the economics of the industry, have been 'relatively sluggish' however, as major foreign carriers have postponed

their purchases to await delivery of the new jumbo jets. This slowdown, with its obvious connotations for the U.S. balance of payments, has been only partly offset by increased military sales overseas .... In the U.S. opposition to SST is being based on a number of grounds. These include the 'moral' issue of spending tax dollars to provide luxury-class transportation in the face of domestic needs; the controversy over aircraft noise and sonic boom, and the potential atmospheric pollution problem .... SST prototype funding won approval by not much more than a dozen votes in the House, and a Senate vote is expected to be much closer. A lack of enthusiasm for the program, expressions of discontent over spending 'back home' and the general mood of the Senate are all contributing to a sense of concern among SST advocates."

4046. "Chairman Train Warns of Serious Environmental Pollution from SST", *Congressional Record,* v. 116, no. 77, 14 May 1970, pp. S7159-S7161. Environmental consequences of proceeding with the development of supersonic transport are discussed by Senator Proxmire and related to the testimony of Russell Train, Chairman of the President's Council on Environmental Quality made before the Subcommittee on Economy in Government. According to Chairman Train, in terms of measures used by the Federal Aviation Administration, the SST would be three to four times louder than current FAA sideline noise standards; the noise pressure level would also be substantially higher than FAA standards; and any attempt to predict atmospheric effects is "necessarily highly speculative at this time". Train offered three proposals for environmental protection against the SST: (1) "the guidelines with respect to noise certification ... should assure that the noise environment in the vicinity of airports at the time of the introduction of supersonics will not be degraded in any way", (2) "we should increase substantially the level of investment in research on the environmental problems associated with the SST", and (3) "the United States should take the initiative in discussing present and potential environmental problems of SST operations with other nations". Senator Proxmire, referring to the first proposal, said "it will in all probability be necessary to prohibit the SST from landing at most of our existing airports", and "continued funding of a prototype ... plane ... seems ... absurd ... We should wait until ... atmospheric effects have been much more thoroughly evaluated before we continue with the development of a supersonic transport."

4047. Sutton, H., "Is the SST Really Necessary?", *Saturday Review,* v. 53, no. 33, 15 August 1970, pp. 14-17, 37-38. Arguments are presented on both sides of the debate over the development of a U.S. supersonic transport, centering around threats to the environment, national priorities, and economic doubt. The environmental concern

is with (1) the "sideline" noise that will occur at airports – the engine being tested is 16 PNdB (perceived noise level in decibels) beyond FAA standards; (2) the sonic boom, which would occur only over the ocean if the FAA rule is followed; and (3) the placement in the upper atmosphere of large quantities of water, carbon dioxide, nitrogen and particulate matter. "Beyond all the threats to the environment are the . . . twin deterrents of national priorities and economic doubt. Should the monies that the government is investing in the SST program . . . be put in medicine, education, and environmental control?" The perceived competition from the Russian TU-144 and the French Concorde supersonics is discussed, along with its potential damaging effect on our balance of payments and the U.S. economy. The author concludes that the supersonic age is here and that stifling the U.S. SST "is not going to make supersonic travel go away".

4048. Hohenemser, K., "Onward and Upward", *Environment,* **v. 12, no. 4, May 1970, pp. 22-27.** This article discusses the principal arguments for and against congressional appropriation for further funding of the supersonic transport (SST) and the technological developments during the past 4 years of the SST program. The three arguments against the SST are (1) to spend large sums of tax money on the SST seems to be a distortion of national priorities when urgent programs, such as poverty, pollution, and education are underfunded; (2) to invest at great risk and low return in a "nonessential commercial enterprise" has been considered an improper use of government funds; and (3) to cause a deterioration of the environment may not be worth the travel time saved for a fraction of the world's population. Aside from self-interest support from agents deriving economic or professional gains, the two general arguments for the SST program are (1) unless the U.S. builds a better SST than the current French Concorde or the Russian TU-144 prototype models, these will be bought both by foreign and U.S. airlines, leading to a balance-of-payments deficit estimated at up to $15 billion by 1990, and (2) a successful U.S. SST program is a symbol of scientific and technological leadership.

4049. Frazier, K., "Hard Questions About Weather Modification", *Science News,* **v. 97, no. 19, 9 May 1970, pp. 461-463.** Social and legal issues that accompany man's ability to modify the weather are the subject of this article and are illustrated in a discussion of the Upper Colorado River Pilot Project. Social questions and considerations include: whether a scientist can alter the environment without permission from the people who will be affected, and moreover, whether or not he should tamper with the weather in view of the lack of certainty regarding all the important consequences of such acts. "What troubles persons not directly involved with weather modification is certain evidence of insensitivity to larger human issues

[e.g., adverse ecological consequences] on the part of enthusiasts". The legal situation in weather modification is regarded as "chaotic" by a National Science Foundation task group studying the subject. "Their final report, to be published later this year, will recommend the creation of a new independent Federal regulatory agency to oversee weather-modification activities."

4050. "S.3919 – The Introduction of Weather Modification Act of 1970", *Congressional Record,* v. **116, no. 90, 3 June 1970, pp. S8230-S8231.** "The purpose of this bill [S.3919] is to require that non-Federally sponsored weather modification activities within the U.S. be reported to the Secretary of Commerce both before and after taking place and to give the Secretary the authority and responsibility for compiling and maintaining records of weather modification activities . . . This legislation is needed in order that the Federal Government may: (1) maintain a record of all weather modification activities in the United States that might affect the public welfare or might affect on-going weather modification research projects; (2) be kept aware of all releases of pollutants in the atmosphere in connection with weather modification activities, and (3) keep the public informed regarding weather modification activities." Conviction of violation of this Act calls for a fine of up to $10,000.

4051. Jordan, W. H., "Nuclear Energy: Benefits Versus Risks", *Physics Today,* v. **23, no. 5, May 1970, pp. 32-38.** In this article, Dr. Jordan, assistant director of the Oak Ridge National Laboratory, discusses the benefits and risks of nuclear-power plants and compares the risks to everyday hazards and to those resulting from the use of fossil-fuel plants. Three major benefits of nuclear-power plants are cited: "a virtually inexhaustible supply of cheap electricity", a cleaner atmosphere, and useful radioisotopes as by-products. Risks of operating nuclear-power plants are classified as (1) "thermal pollution of the rivers and lakes", (2) "low-level release of radioactivity into the air and ground waters caused by the normal operation of nuclear-power and reprocessing plants", and (3) "the accidental release of large amounts of radioactivity". The author presents arguments and analyses which indicate "that the hazard from the presently regulated amount of radioactivity released in normal operation of a nuclear-power station is much less than from the pollutants emitted by the operation of a fossil-fueled station". He discusses safeguards that are taken as part of the operation of a nuclear-plant and concludes that the probability of an accidental release of large amounts of radioactivity is "exceedingly remote", and that "there *is* some risk, but it is surely worth it".

4052. "NSF Opens Ocean Exploration Program", *Washington Science Trends,* v. **XXIV, no. 17, 3 August 1970, p. 95.** "The National

Science Foundation announced this past week plans to review grant and contract proposals for participation in the new International Decade of Ocean Exploration (IDOE). NSF has been assigned 'lead agency' responsibilities for the U.S. share of the program, which is expected to receive approximately $15 million in funding for the fiscal year which began July 1. [NSF] Director W. D. McElroy emphasized that the magnitude of funding will be 'relatively large' because projects will be broad and multidisciplinary. For this reason, the number of grants or contracts to be awarded will be limited and small projects will be supported only as 'integral parts of broader activities'. Funds will be concentrated on a limited number of initial themes: *Environmental quality.* Studies to provide comprehensive 'baselines' of the chemical and biological characteristics of the entire ocean, with particular application to pollution monitoring and control. *Environmental forecasting.* Studies with emphasis on modeling and oceanic variability, air-sea interaction, upwelling and the flow of energy, nutrients, and other substances through the food web. *Seabed assessment.* Studies with emphasis on the topography, structure, and dynamic properties of the continental margin and deep ocean floor, including the general character and stratigraphy of ocean sediments. McElroy pointed out that rapid availability and accessibility of data and intercalibration of instruments will be emphasized."

4053. **"Introduction of Bill to Extend the Sea Grant College Program for 3 More Years"**, *Congressional Record,* **v. 116, no. 90, 3 June 1970, pp. H5054-H5055.** In this speech, Congressman Frey announces his amendment to the 1966 Marine Resources and Engineering Development Act calling for a $15 million appropriation for the sea grant college program for FY 1970, with $5 million annual increases through FY 1973. He reviews the National Science Foundation mandate to implement the program with contracts or grants to academic institutions or laboratories to foster the development of marine resources and education in marine science. Fringe benefits of this program, in the form of guidelines for multidisciplinary-research techniques and academic-industrial alliances toward "intelligent and innovative application of Federal grants", are pointed out.

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5015. Killian, J. R., Jr., "University Research and National Priorities", *Technology Review,* **v. 72, no. 9, July/August 1970, pp. 23-25.** The author discusses the role and some achievements of university research with a look at the problems created by the erosion of financial support. Noting that the university has the responsibility for most of the nation's basic research and scholarly studies, the author states "today universities, particularly their program in science and engineering, are moving into a critical period. The federal government is cutting back on funds for research, and in a manner that is unplanned and therefore more damaging. This reduction is made much more serious by steady inflation. The consequent curtailment of research not only affects the amount of work done but also its quality and the training of men and women to do research . . . It threatens to erode the preeminent position of the United States in science and technology. The nation also is undergoing a period of skepticism about the benign uses of science and technology, and there is too much tendency to blame science and technology for their misuse instead of dealing with the more central problems of how to direct these great resources toward humane ends. The way to ensure a humane environment and to advance the quality of society is not to cut back on the contributions of science and engineering, particularly at a stage of flood tide in creativity in these fields, but rather to master the problems of control and use, of technology assessment, and of foresight."

5016. Hersey, I. (Ed.), *Systems Approaches to the City – A Challenge to the University,* **National Academy of Engineering, Washington, D.C., 1970, 68 pp.** This document summarizes the proceedings of a workshop held for the purpose of bringing together faculty members, students, government officials, industry representatives, and union leaders in an attempt to determine how universities could respond to the need to alleviate urban problems. Included is a discussion of current urban technology programs at Stanford, MIT, and the University of California (Berkeley) and the results of a survey of urban research activities in 76 other universities in the U.S. Other subjects included are "Institutional Requirements", "Teaching: Interdisciplinary Cooperation, Faculty, and Course Material", "City-related Research: Conduct, Content, and Purpose", "University Goals and their Interaction with Urban Needs", and "Service: Faculty and Student Participation in Community Action". A few of the eleven conclusions and recommendations presented are (1) "contrary to some prevailing public opinion, it is not true that urban problems will be solved by declaring a moratorium on science and technology while allowing society to come abreast with the present state of the

technology"; (2) "before urban systems engineering is fully accepted by the body politic, it is necessary that educational institutions initiate a wide spectrum of innovative and pioneering programs"; and (3) "presently the universities are meeting most of the costs of urban engineering". (This report can be obtained from the National Academy of Engineering, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.)

5017. *Environmental Science Centers at Institutions of Higher Education,* **A Survey Prepared for the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics, U.S. House of Representatives, 15 December 1969, 17 pp. (plus appendix).** The findings of a questionnaire survey regarding interdisciplinary programs in environmental quality are presented in this report. The information, obtained from some 100 colleges and universities, describes the structure and composition, functions, and funding involved in the various "environmental science centers" established at these institutions. The general findings of the survey are summarized and the specific programs at each institution are briefly described. The survey, it is suggested, "should help Federal agencies tailor their aid to the needs of education and research" and "to assist communication among the developing environmental centers". (The report can be obtained from U.S. Government Printing Office, Washington, D.C. 20402.)

5018. Walsh, J., "Project Themis: Budget Cuts, Critics Cause Phase Out", *Science,* **v. 169, no. 3947, 21 August 1970, p. 749.** "Project Themis, the Department of Defense's program to create new academic 'centers of excellence' by broadening distribution of defense research funds to universities, is succumbing to budget pressures and to opposition in the academic community to DOD involvement in university research." Though Themis has no funds in the FY 1971 budget (which began on 1 July 1970), many of the 118 Themis centers started over the past 3-1/2 years are still operating on money committed earlier or obtained from other sources. Themis projects spent a total of $88.7 million on manpower and facilities for research in areas related to DOD needs. Active hostility by critics on campus and in Congress, together with the budget squeeze, caused "the decline and fall [of Themis to occur] more precipitously than its Pentagon creators expected".

5019. Gruchow, N., "House Bill Hits Campus Unrest", *Science,* **v. 168, no. 3933, 15 May 1970, p. 807.** The House Armed Services Committee, in its military authorization bill for 1971 contains a provision that "bars defense research funds from schools at which recruiting personnel for the armed services are barred or hampered, unless the funds are a renewal of a project that makes a 'significant

contribution' to defense ... According to the House committee's chief counsel, the committee intends to be sterner than the provision would indicate. In its report, the committee declared that it will require a listing by the Defense Department of all research funds granted to institutions where student disruptions have taken place and that, next year, it will consider restrictive legislation unless the Secretary of Defense can implement a procedure to deny funds to those campuses ... "Opponents in the House are relying on the Senate in this instance, as in previous ones, to moderate the bill, and they are hoping the provision will at least come up for full debate later this spring."

5020. McElheny, V. K., "MIT Administration Makes Public Its Intentions on Disposition of Draper and Lincoln Laboratories", *Science,* v. 168, no. 3935, 29 May 1970, pp. 1074-1075. "The Massachusetts Institute of Technology has reached what may be a resolution of its responsibilities toward two of the largest and most distinguished university defense research centers, Lincoln Laboratory in Lexington, Mass., and Draper (formerly Instrumentation) Laboratory in Cambridge. A decision to cut loose from Draper while retaining ties to Lincoln, already approved by M.I.T.'s Corporation (trustees), was announced to the faculty 20 May by President Howard W. Johnson. The decision constitutes, in effect, a declaration that M.I.T. wants to get out of developing specific weapons systems (as at Draper) but will continue working on broader military problems (as at Lincoln). M.I.T. decided to begin the ... process of divesting itself of Draper because it had failed in the short run to find the money needed to implement a policy of 'converting' the two laboratories toward a greater civilian emphasis." Budget and administrative effects are discussed.

5021. "Defense Contracts at Stony Brook", *Science,* v. 168, no. 3935, 29 May 1970, p. 1076. "The faculty senate at the State University of New York at Stony Brook has passed a resolution urging the university community not to seek new research grants or contracts from the Department of Defense and not to renew existing grants or contracts. The recommendation applies to both classified and unclassified research. Some universities have previously banned classified research, but none is known to have banned all military research. The faculty action is an advisement to the president of Stony Brook, who has taken the matter under consideration".

5022. "G. I. Bill in Reverse", *Chemical & Engineering News,* v. 48, no. 31, 27 July 1970, p. 10. In hearings on national science policy by the Subcommittee on Science, Research, and Development, Dr. Philip Handler, president of the National Academy of Sciences and Dr. George Kistiakowsky of Harvard's chemistry department made critical

comments and recommendations on U.S. science affairs. Dr. Handler proposes a National Youth Service Program in which the Federal Government would underwrite graduate-level education, in return for which recipients would serve a specified time "in a national service, as teachers, for instance, in 'disadvantaged areas'... [He] urges continued coupling of research to the educational process... [and] a rather large-scale program of formula grants to colleges... Dr. Kistiakowsky holds that segregation of all scientific research in one agency, the National Science Foundation, for instance, 'would tend to erect impenetrable walls to the spread of scientific information'. He favors, however, expanding the National Science Foundation to be the 'patron of basic research'."

5023. Dressel, P. L., and Come, D. R., "Impact of Federal Support of Science on the Publicly Supported Universities and Four-Year Colleges in Michigan", an Interinstitutional Study Supported by National Science Foundation Contract NSF-C-506, March 1969, 135 pp. This study examines the mechanisms, policies, and implications of Federal support of science activities at Michigan colleges and universities and offers some recommendations for planners and policy makers at the Federal, State, and school levels. The study describes and discusses the patterns of research support, problems in financing science research, the impact of funds on science education, effects on administrative organization and practices, and major issues and policy problems. On the basis of these findings, the report presents several observations and recommendations including the following: "current governmental budgeting and support decisions often... [force schools] into strategies of opportunism... [and] frustrate academic planning"; "cost sharing places an unreasonable burden on all institutions"; Federal agencies should "allocate a larger proportion of... support in the form of institutional grants... for a period of at least three years"; "individual institutions must do their planning with an eye on each other and on the regional needs and resources"; and "the tendency [in a research-oriented institution] to regard undergraduate teaching as a burden to be assumed by second-rate... faculty must be corrected".

5024. "Federal Council for Science and Technology Catalog", *Science*, v. 168, no. 3932, 8 May 1970, p. 682. "The Federal Council for Science and Technology has published a reference catalog for use by laboratories and universities interested in exploring the possibility of establishing joint laboratory-university programs. The 'Catalog of Federal Laboratory-University Programs and Relationships' provides a description of the many types of training programs and cooperative relationships that exist among federal laboratories and contract centers and universities." (The catalog may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price: 75 cents.)

6000 SCIENCE, MANAGEMENT AND POLICY-MAKING BODIES

6041. Walsh, J., "Science Policy Budget Cuts Prompt Closer Look at the System", *Science,* v. 168, no. 3933, 15 May 1970, pp. 802-805. Discontent with cutbacks in government-supported research has prompted prominent scientists to analyze "the crisis in science in terms of new social priorities and changing public attitudes toward science and technology". Factors influencing the breakdown of both the premises and institutional arrangements for the support of science include the following: (1) the pluralistic, decentralized system of support with loose funding accountability, (2) "the sheer size of the rapidly increasing R&D budget", (3) the debate on national priorities, (4) Section 203 of the Mansfield Amendment, and (5) changing relationships between government and the university (seen as a key issue). These factors have led to a renewed interest in the science superagency for the management and decision processes of federal science policy. Also, a decrease in science advocacy among Congressmen, declining advisory influence of the Office of Science and Technology, and increases in the White House staff, implying potential lessening of the Bureau of the Budget's decision-making power in science spending, have further increased interest in the science superagency. One such agency is the recently proposed National Institute of Research and Advanced Studies (NIRAS). An alternative to the NIRAS is "the planned growth over a reasonably short period of the NSF budget to a billion dollars", which "might in fact salvage the prevailing federal support system".

6042. Boffey, P. M., "Nixon Administration Accused of Downgrading Science", *Science,* v. 169, no. 3942, 17 July 1970, p. 265. "The charge that the Nixon Administration has thrown the system of science support into 'disarray' was made on 7 July by A. Hunter Dupree, professor of history at Brown University at . . . hearings on national science policy before the House subcommittee on science, research and development . . . 'The Administration is checking budgetary support, applying political tests to appointments for scientific positions and dismantling the organization for science within government,' Dupree charged." He said that "At the government end of the plural system the whole of the health area has lost its bearings", and further complained "that the Administration is causing great problems in the universities by making fellowship cuts in fields favored in the past by government science policy . . . without making compensating additions in 'fields where an increased demand is clearly foreseen', such as the environment". Dupree was not "optimistic that the Administration will take steps to improve its science policies. 'If the executive branch is thinking about science

policy', he said, 'no evidence of it gets into the public press . . .' " He also charged that "under the Nixon Administration, 'major reorganizations of science agencies emerge from commissions which have not called for public discussion nor given public critics an opportunity to be heard' ". He contrasted the present downgrading of science policy with the high priority given to it in the immediate post-Sputnik years. While Dupree's criticism was challenged by Representative Charles Mosher, Mosher did allow that after Sputnik " 'There was the . . . highly emotional concentration on the sciences, the shocked recognition that we had to do something. Now we are diverted by so many other things . . . that I am afraid the central organization of science . . . has taken a secondary role in the Administration's thinking, . . . and I would hope that it was only a temporary attitude or situation' ".

6043. **"The Rising Debate on Science Policy"**, *Science News*, **v. 98, no. 364, 25 July 1970, pp. 57-58.** Hearings by the Subcommittee on Science, Research and Development "to consider 'whether a structured national science policy is desirable in the future, and if so, what the elements of that policy should be' " have prompted sharp criticism of the Administration's "antiscience attitude" by Dr. A. Hunter Dupree, Brown University science historian (Abstract 6042). Dr. Lee DuBridge, Presidential science adviser, after further attacks on the Administration's deficiencies by an editorial in *Nature* (11 July) called a press briefing. "Ostensibly to explain OST's [Office of Science and Technology] diverse activities, the session was later acknowledged to be an attempt to counter what was termed the badly informed recent criticism of the Administration's attitudes on science." "To Dr. DuBridge, as to all of his predecessors, the dangers of a too-rigid and formalized science policy seem too important to be overlooked." OST Deputy Director Hubert Heffner maintained that the Administration has "an intense interest in science" and that " 'Of all the controllable areas in the budget, science was the most favorably treated . . .' Dr. DuBridge placed some of the blame on Congress. He repeated his earlier-expressed opposition to the Mansfield Amendment, which he said was directly responsible for $8 million or $9 million of the $28 million in Defense Department cuts of funds for university research . . ." and expressed the hope "that most of the real high quality research will be picked up by NSF".

6044. **"Mansfield Amendment: Future in Doubt"**, *Science News*, **v. 97, no. 21, 23 May 1970, p. 501.** The Mansfield Amendment "has been drawing increasing fire from academic scientists caught in the current budget squeeze. Even those who agree with its intent, to lessen the dependence of science on the military, are now concerned over its effects: a further shrinkage of sources for support of fundamental science." Expectations that NSF would be able to fund "most of the

basic science dumped by Defense have not been fulfilled". "The House Armed Services Committee this year showed a sympathetic ear to the complaints.... 'This seemingly innocuous provision now appears to be fraught with danger,' the committee said, 'for it adversely affects research efforts involving the security of the nation 5 to 10 years from now.' " While the House "passed a Bill devoid of Section 203", Mansfield still opposes "Defense primacy in basic research funding".

6045. **Boffey, P. M., "DuBridge and His Critics: Science Adviser's Critique of Mansfield Amendment Draws Sharp Rebuttal from Senate Majority Leader", *Science,* v. 169, no. 3943, pp. 169, 357.** In a congressional subcommittee hearing in July, Presidential Science Advisor Lee A. DuBridge was asked if he thought the Mansfield amendment was wise, since it " 'greatly reduces or abolishes' Defense Department support of basic science that is not related to military programs." His negative reply drew a "stinging attack" from Senate Majority Leader Mike Mansfield. DuBridge's point was that "the Mansfield amendment had had no impact on the dollar amount of the cuts made in the military research budget..., but that the amendment had adversely affected the quality of the research projects cut (since some of the highest quality projects were deemed the least relevant)". Mansfield contended that "support of high-quality projects affected by the amendment" could be sustained "by transferring them to other agencies", notably the National Science Foundation. The interagency coordination needed to do this "is the responsibility of the Bureau of the Budget and DuBridge's own Office of Science and Technology", but Mansfield said he had seen "little initiative or leadership" from that office. He hinted that the nation's science policy needs some searching scrutiny.

6046. **"Science Policy: Involving the Citizen", *Chemical & Engineering News,* v. 48, no. 32, 3 August 1970, pp. 16-17.** "Gripes about U.S. science priorities might be muted and a growing antiscience attitude – especially among university students – stemmed, if the citizenry at large had a greater involvement in the formulation of science policy. At least that's the view of Dr. William McElroy, director of the National Science Foundation, and Dr. H. E. Carter, chairman of the National Science Board and vice chancellor for academic affairs at the Urbana-Champaign campus of the University of Illinois." Dr. McElroy said that "NSF... should increase its research funding (for fundamental and applied research) to about 35 to 40% of all federal support of academic science. It now funds about 18%." Dr. Carter agreed and added "that the research project support system should be strengthened and extended – not curtailed or abandoned". McElroy said there was a need for "interdisciplinary, problem-oriented curriculum 'combining the insights and skills of the humanities and the sciences concentrating on current problems' ".

6047. Walsh, J., "Science Adviser DuBridge Retires, David Nominated as Successor", *Science,* v. 169, no. 3948, 28 August 1970, pp. 843-844. A professional sketch of Edward E. David, Jr., successor to retiring Presidential science adviser Lee A. DuBridge is presented together with an appraisal of DuBridge's accomplishments in office. During his 19 months as science adviser and director of the Office of Science and Technology, DuBridge is credited with influencing the Administration to moderate the space program, with initiating steps to meet the anticipated crisis in electric-power generating capacity, with contributing to Nixon's renunciation of biological warfare, and with assisting "the modest recovery in the fortunes of the National Science Foundation". "DuBridge has been more active than any of his predecessors were in pushing initiatives toward building workable machinery for making science policy." Edward David, who is 45, is executive director of communications systems research at Bell Laboratories and "is the first to come to the science adviser's post from industry rather than the university," although he is on the electrical engineering faculty at Stevens Institute of Technology. He is an active member of the National Academy of Sciences and National Academy of Engineering, and has served as a consultant to a number of federal and civilian agencies. "At Bell Labs he is regarded as being very able and ... 'hardworking and hard-headed' without being abrasive".

6048. Brooks, H., "Technology Assessment", *News Report,* National Academy of Sciences, National Research Council, National Academy of Engineering, v. XX, no. 6, June-July 1970, pp. 2-3. In these excerpts of testimony before the House Subcommittee on Science, Research and Development, Dr. Harvey Brooks discusses some of the needs and problems of technology assessment and suggests some criteria that should be considered in the formation of technology assessment mechanisms in the Federal Government. The current popularity and "over-concentration" on "environment" and "ecology" may produce "bad side effects" and what is needed instead is "the more balanced and comprehensive approach of technology assessment" in the Executive and Congressional branches of government, claims Dr. Brooks. "Many of the deleterious side effects of technology are actually due to the unbalanced development of technology, often the lag of technology in the public sector behind that in the private sector .... unless we very soon develop better measures for technology assessment, it is likely that ill-considered political reaction against technical progress will produce a crisis in our society which will make the environmental crisis look tame by comparison." Another problem is that of reducing the credibility gap between the public and the government in regard to the validity of technological assessments carried out in connection with federal programs. "I do not believe technology assessment can influence

government policy to the degree necessary unless there is a strong counterpart to the Congressional mechanism [proposed Office of Technology Assessment] in the Executive Branch, a mechanism which is independent of the technological interests and biases of the existing mission-oriented Executive departments and independent agencies."

6049. **"Who Should Count the Cost?", *Nature,* v. 226, no. 5249, 6 June 1970, pp. 885-886.** Objections are raised to Chairman Emilio Daddario's proposal for an Office of Technology Assessment on the basis "that such an organization would have to be staffed by men of outstanding and almost unprecedented intellectual strength and moral virtue if it were to carry weight with the congressional committees which are most in need of the help which Mr. Daddario is anxious to provide". The supersonic transport issue is mentioned as a case in point: "No amount of academic study by an Office of Technology Assessment could have uncovered this kind of internal conflict . . . . The truth, of course, is that even matters of technology assessment are political issues in the broadest sense". Instead of an Office of Technology Assessment, it is asserted that "If Congress really wishes to improve the degree to which society can control the uses made of new technology, the best thing will be to stimulate and encourage the organizations which are independent both of the Administration and the legislature to make reasoned cases for or against particular innovation. Rather than setting up an entirely new organization to make academic studies of these matters, Congress would be better advised to be even more ready than at present to listen to what outsiders have to say. . . . .The fact that it would often be necessary to go outside the universities proper to find suitable advisers is not to be scoffed at but rather welcomed."

6050. **"Two Cheers for OTA", *Nature,* v. 226, no. 5250, 13 June 1970, p. 998.** Industrial representatives presented their points of view on the proposed Office of Technology Assessment (OTA) at hearings before the Subcommittee on Science, Research and Development. "The bill requires that the staff of OTA have no conflicts of interest with industry" and Dr. W. E. Hanford, vice-president for research and development of Chemical Group of Olin Corporation, "felt that with so few qualified people available, it must remain essential for some time that they wear several hats at once." General J. M. Gavin, chairman of the board of Arthur D. Little said that "Industry would be only too happy to cooperate with the OTA". He felt that the "unprecedented rate of scientific advance makes it essential that the technological assessment should be part of the legislature". Critical comments on the OTA from various sources are briefly noted.

6051. **"Capitol Comment: McElroy Testifies on Technology Assessment", *BioScience,* v. 20, no. 12, 15 June 1970, p. 720.** William D.

McElroy, director of the National Science Foundation told members of the House Subcommittee on Science, Research and Development during hearings on the Technology Assessment Act "that he supported 'fully and enthusiastically the objectives of this bill.' However, he expressed the opinion that 'this can be done today only in a limited fashion' ". He warned against obscuring the importance of basic research "in the concern over technology assessment" and recommended "the use of the National Environmental Policy Act of 1969 as a vehicle for developing the national capability in technology assessment". "He urged that . . . any institutions charged with the responsibility of assessment be supplemental to, rather than a substitute for, existing programs." Dr. Edward Wenk, Jr., professor of Engineering and Public Affairs at the University of Washington, formerly the National Council on Marine Resources and Engineering Development's executive secretary "advocated the establishment of a 'broadly-based Commission on Social Management of Technology, independent of both branches' . . . [the] Commission would be an 'activist' agency, as 'an advocate for the public interest, but never as an operating agency to implement its own recommendations' ". He supported Congressman Daddario's bill "without reservation" but "raised 'cautionary notes . . . as to whether the necessary apparatus can be designed without consideration of the necessity for formulating a national policy, and for creating a visible institutional vehicle to provide the missing ingredient for blending human values and technical competence' ".

6052. Kiefer, D., "Business Perspectives: A Stance for Industry in Technology Assessment", *Chemical & Engineering News*, v. 48, no. 29, 13 July 1970, p. 20. Current Congressional and Administrative interest in technology assessment is briefly reviewed. However, it is noted that "industry has been conspicuous largely by its silence. Industry spokesmen have had little to say, at least in the public record. Corporate officials for the most part seem to be unfamiliar with current proposals, uncertain of their implications . . . Yet any technologically oriented industry has much at stake . . . Certainly industry must have some role in any public mechanism set up to conduct assessments, for it is in industry that much of the needed technological expertise resides. But questions of conflict of interest or credibility probably will circumscribe the part it can play. What industry can do – and probably the sooner the better – is to develop an internal assessment stance of its own. . . . What is needed, perhaps, is some type of counter commercial development and market planning structure within the corporate hierarchy, able and willing to evaluate business goals not merely in traditional terms of technological practicality and economic profitability but by probing searchingly into broad, indirect, and less obvious social consequencies as well. . . . It's a task that industry may soon find that it cannot afford,

either from an economic or a public relations standpoint, not to do."

6053. **Carter, L. J., "Reshuffling the Bureaucracy: Nixon Proposes Pollution, Ocean Agencies", *Science,* v. 168, no. 3938, 19 June 1970, pp. 1433-1435.** President Nixon is requesting Congress to approve the establishment of an Environmental Protection Administration (EPA) and a National Oceanographic and Atmospheric Administration (NOAA). Plans for both bodies were worked out by the President's Advisory Council on Executive Organization under Roy L. Ash. Over a dozen pertinent programs and activities now under other agencies or departments are to be transferred to the two new agencies under the Department of Commerce. Political implications of such a reshuffle and the reactions expected of key legislators and administrators are discussed.

6054. **"Council on Environmental Quality Guidelines", *Congressional Record,* v. 116, no. 89, 2 June 1970, pp. E5089-E5090.** "This memorandum provides interim guidelines to Federal departments, agencies, and establishments for preparing detailed environmental statements on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, as required by . . . the National Environmental Policy Act . . . Before undertaking major action or recommending or making a favorable report on legislation that significantly affects the environment, Federal agencies will, in consultation with other appropriate Federal, State, and local agencies, assess in detail the potential environmental impact in order that adverse affects are avoided, and environmental quality is restored or enhanced, to the fullest extent practicable. In particular, alternative actions that will minimize adverse impact should be explored and both the long- and short-range implications to man, his physical and social surroundings, and to nature, should be evaluated in order to avoid to the fullest extent practicable undesirable consequences for the environment."

6055. **"Engineering Academy, Research Council Expand Transportation Services", *News Report,* National Academy of Sciences, National Research Council, National Academy of Engineering, v. XX, no. 6, June-July 1970, p. 10.** "Transportation Advisory services of the National Academy of Engineering and research-clearinghouse functions of the National Research Council are being expanded. The NAE has authorized the establishment of a new Committee on Transportation 'to provide expert and broad counsel and advise on engineering matters,' and the NRC has established new railroad and maritime research information services. The new NAE committee — to be chaired by Seymour W. Herwald, Westinghouse Electric Corp. vice president for engineering and an NAE member — will review

'transportation-related engineering objectives and priorities and their interrelationship with the environment' and will provide a transportation-technology forum for engineers and others, including city officials and attorneys, concerned with transportation problems . . . The National Research Council's Highway Research Board has enlarged its research information services to include storage and retrieval of information on transportation noise abatement. A new Railroad Research Information Service and a new Maritime Research Information Service, both in the NRC Division of Engineering, will use the Highway Research Board's computer system, resulting in an integrated highway-rail-maritime transport information system."

6056. **"No Shakeup at AEC"**, *Chemical & Engineering News*, v. 48, no. 26, 22 June 1970, p. 17. While "Rumors of an impending shakeup of the Atomic Energy Commission" had not been denied at press time, "AEC Chairman Glenn T. Seaborg told C&EN that although the matter is up to the President, he expects no decision soon to drastically reshape the AEC". Current rumors deal with the possibility that the AEC will become "an agency dealing with all forms of energy while losing military programs to the Defense Department and research activities to the National Science Foundation. Already established is that AEC will lose some radiation-standard-setting activities to the contemplated Environmental Protection Agency." The AEC's regulatory and licensing functions will probably be retained, according to "A highly placed White House source." "Meanwhile, AEC's powerful friends in Congress will likely vigorously fight any sweeping changes to the agency".

6057. **"Grant to State Legislature, Five Others, to Help State Science Planning", National Science Foundation, News Release NSF 70-162, 27 May 1970, 3 pp.** "A grant to a state legislature – the first such award ever made by the National Science Foundation – highlights six state planning grants awarded . . . as part of the activities of the newly constituted Office of Intergovernmental Science Programs." The grants are briefly described as follows: (1) *Assembly Office of Research, California Legislature,* $63,500 – "a 14-month demonstration project to describe and assess the benefits of a newly established Assembly Science and Technology Advisory Council (ASTAC) as a vehicle for improving the use of scientific and technological information in the decision-making processes"; (2) *Louisiana State Board of Nuclear Energy,* $15,000 – a project directed toward "development of a state environmental science policy"; (3) *Montana State University,* $10,000 – a study-seminar project "to forecast scientific and technological developments that may have substantial impact on major areas of Montana government, and then recommend science policies and institutions to assist in the state's development"; (4) *Frontiers of Science Foundation, Inc.,* $15,000 – a project directed

toward "developing Oklahoma science policy"; (5) *Pennsylvania State University*, $63,300 – a study of "the impact of intergovernmental organizations on how pollution programs are defined, how scientific and technical knowledge is sought and funded, and how existing or developing techniques are incorporated into operations programs"; and (6) *State Council of Higher Education for Virginia,* $25,000 – a project "to shape more effective mechanisms for enabling state governments to use available academic resources effectively in dealing with environmental problems having a science or technology component".

6058. **"Politics Kills Hammond's NSF Bid"**, *Chemical & Engineering News*, **v. 48, no. 23, 1 June 1970, p. 15.** "Dr. George S. Hammond, chairman of the division of chemistry and chemical engineering at Caltech, has reluctantly withdrawn his name from active consideration for the number-two spot at NSF as deputy director." The reason, according to Dr. Hammond, stems from a speech on May 1 at a Caltech rally regarding Cambodia in which "he expressed the hope that the President's party would lose at the polls next fall and 'clearly so' over the new move in Southeast Asia. This talk appears to have made him 'politically unacceptable,' the Caltech chemist tells C&EN's Tom Feare." While neither Dr. Lee DuBridge nor Dr. McElroy could be reached for comment, their spokesmen "flatly refused to comment publicly on the matter, with Dr. DuBridge's spokesman stressing that Dr. Hammond withdrew his name". "Understandably, Dr. Hammond is quite disappointed by the blocked appointment. Stimulated by the prospect of working on the internal problems of U.S. science – which he terms are in a 'shaky state' now – and on changing public attitudes toward science, the loss of the appointment came as quite a blow. However, the political reasons for the decision against him and the lack of political isolation for NSF despite Presidential assurances trouble him even more".

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7016. Nelson, G., "We Need a New Global Agency to Confront the Environmental Crises", *Congressional Record,* v. 116, no. 101, 18 June 1970, pp. S9287-S9288. In this article (reprinted from *War/Peace Report,* May 1970), Senator Gaylord Nelson proposes that the international community establish a World Commission to Preserve the Environment. The purposes of the Commission would be to set up a global monitoring system and to initiate cooperative efforts to solve the problem of offenses against the environment. The Commission could also carry out research on all aspects of the environment and conduct educational programs for the general public. This Commission would be associated with the United Nations in much the same manner as other international agencies. Its composition and voting procedures would "properly reflect population and power distribution in the world". Each government would contribute to the budget appropriation "in accordance with the rules of the Commission and that government's own procedures. The commission members would have to be named through a process of government consultations, but once appointed they should be free to vote their own mind and consciences."

7017. "Senate Resolution 399 – Resolution Submitted to Create a World Environmental Institute", *Congressional Record,* v. 116, no. 65, 27 April 1970, pp. S6219-S6221. A resolution introduced by Sen. Magnuson to create a World Environmental Institute states "be it **resolved**, that the Senate recommends, urges, and supports the creation of a World Environmental Institute to act as a global research center and to disseminate knowledge of environmental problems and their solutions to all nations of the world upon request; and be it further **resolved**, that said World Environmental Institute should be independent of existing international organizations, non-political, and open to all nations of the world, with its location and funding to be agreed upon by representatives of said nations assembled; and be it further **resolved**, that the Senate recommends and urges that the United States representatives to the First International Conference on the Human Environment prepare to propose creation of the World Environmental Institute to the Conference; and be it further **resolved**, that in furtherance of the World Environmental Institute concept, the Senate recommends, urges, and supports the invitation to the Conference of all nations not presently members of the General Assembly of the United Nations; and be it further **resolved**, that the Senate recommends, urges, and supports creation of the World Environmental Institute as an official policy of the United States government, to be pursued with other nations both formally and informally,

at Stockholm and in other appropriate forums where the cause of the Institute can be furthered."

7018. **Paddock, W. C., "How Green is the Green Revolution?", *BioScience,* v. 20, no. 16, 15 August 1970, pp. 897-902.** The Green Revolution caused by the introduction of "miracle grains" in South Asia is examined in detail and its validity is contested. The influence of weather, price supports, irrigation problems, and the dangers of planting genetically similar varieties in any one region minimize the possibility of any Green Revolution solving the world food problem. For example, India increased agricultural production by 46% in the 1951-1961 decade, partly with new technology but primarily by putting new land into use. "As new land became scarce, the increase tapered off. To simply maintain current per capita consumption levels, India must now increase cereal production by three million tons each year . . . Whether the Green Revolution is a fact or a myth, the consequences of an agricultural breakthrough without an accompanying breakthrough in population control are ominous. To feed today's world population requires the use of agricultural chemicals, the pollutants of which will have a deleterious effect on our children and on their children. But we have seen nothing yet! By 1985, the demand for food in the hungry world will more than double. If the hungry world is then to feed itself, it must increase its use of fertilizers by 100% and pesticides by 600% . . . Such an increase in the use of chemicals to feed the projected populations could wreck our environment." The author points out that more food production means an accelerated population explosion and cites by way of example the Green Revolution in Ireland in the 18th Century. After the introduction of the potato, the Irish population swelled from two million to eight million: a new plant disease resulted in the famine of the 1840's and two million Irish starved, two million emigrated, and four million remained in abject poverty. "When there is such a thing as a Green Revolution, its name will be disaster if it arrives ahead of a Population Control Revolution".

7019. **Basiuk, V., "Technology and World Power", *Headline Series,* no. 200, April 1970, Foreign Policy Association, Inc., New York, 63 pp.** This report discusses the trends and the impact of the technological revolution in the U.S., U.S.S.R., and Western Europe in relation to world power. Five major trends are cited in the technological revolution: (1) "the decreasing importance of the location of raw materials and sources of energy", (2) "the integrative effect of technology on society and the integrative process within technology itself", (3) "the increasing, and increasingly versatile, global projection of national influence and power through technology", (4) the "growing scale" of technology, "which requires enormous expenditure and resources for its utilization", and (5) "the continuously accelerating growth of

technological innovation and change". The prospects for U.S. global power through the use of technology rely on the competitive change in its institutions and methods of resource allocation. "The growth of science and technology is likely to make the Soviet society more complex and differentiated, with professionalism enjoying greater influence and authority becoming more widely dispersed . . . If Western Europe succeeds in adjusting its legal and fiscal structure, its scientific and technological institutions and its values, if it considerably enhances its technological capability and weathers or avoids the potentially disruptive effects of the technology that will affect Europe in the early 1980's, political changes in the European picture are likely to follow." (For sale by the Foreign Policy Association, Inc., 345 E. 46th St., New York, N.Y. 10017. Price: $1.00.)

7020. "Political and Legal Aspects of Earth Resource Surveying by Satellite", *International Science Notes,* Bureau of International Scientific and Technological Affairs, Department of State, Washington, D.C., no. 24, March 1970, pp. 14-17. The pros and cons of regular monitoring of the earth's resources and environment by satellite, along with attendant technical, economic, and political problems, are discussed. Technical problems having to do mainly with collecting earth-resource data and transmitting them to earth are already being tackled in the U.S.'s ERTS-A program, which is directed toward an experimental satellite to fly in 1972. The economic and political problems center around concerns abroad over intrusion of national privacy, exploitation of resources by foreigners with access to the data, voices in policy and program decisions, priorities in applications and needs, and financial and technical capability to put the earth-resource-survey data to work. International law related to outer space encourages countries to cooperate in its exploration and use for the benefit of all. The article concludes that the U.S. should proceed promptly and openly, with maximum foreign participation, to develop the capability for earth-resource surveying from satellites.

7021. "NAS Council Proposes Open Waters", *BioScience,* v. 20, no. 13, 1 July 1970, p. 771. "The Council of the National Academy of Sciences has recommended that the government open ocean waters subject to U.S. jurisdiction to scientific research by foreign nations, in order to encourage other countries to ease their own restrictions . . . A position paper . . . suggests that security safeguards might include advance notice, the right of U.S. scientists to participate in the research, inspection rights covering all equipment aboard research vessels, and assurances that the research would not adversely affect the uses or resources of the sea or seabed. The policy would not apply to internal waters." NAS President Philip Handler noted that " 'limitations that nations have imposed upon free scientific research

and exploitation of the sea and seabed have become increasingly severe. Every indication suggests that this trend is accelerating, much to the detriment of scientific research by all nations.' "

7022. **"Government Aid for Technology Exports"**, *Washington Science Trends,* **v. XXVI, no. 6 18 May 1970, pp. 31-34.** "The Federal Government's export campaign to help ease the balance of payments problem is focusing on scientific and technical products . . . Commerce Department officials believe the best way they can assist export drives is through 'exposure' and information. At U.S. Trade Center exhibitions, for example, U.S. firms are promised ready-made exhibits, contact with the Trade Center's permanent staff and facilities, business information on local firms, general market information, and some assistance in negotiating commercial transactions. For a typical Trade Center show, firms need not spend much more than a participation fee, one-way freight for exhibit goods, and the expense of providing a qualified representative. For trade fairs, and other exhibitions with official U.S. participation, other arrangements, more or less favorable, may be available." A schedule for 23 trade center shows and exhibitions, a bibliographic listing of selected market guides, and reports on technology and industry abroad are provided. (For further information, contact U.S. Department of Commerce, Trade Missions Division (BIC-926) or Commercial Exhibits Program (BIC-932), Washington, D.C. 20320.)

7023. **"East Europe Exchange Programs"**, *News Report,* **National Academy of Sciences, National Research Council, National Academy of Engineering, v. XX, no. 7, August-September 1970, pp. 14-15.** "The Office of the Foreign Secretary of the National Academy of Sciences has invited exchange-program applications from American scientists who wish to visit the Soviet Union, Bulgaria, Czechoslovakia, Poland, Romania, or Yugoslavia some time in the 1971-72 academic year. Applicants must be U.S. citizens and must have earned, prior to the visit, a doctorate or its equivalent in the physical, biological, behavioral, engineering, or mathematical sciences. Under NAS inter-academy exchange agreements, visits may be from 3 to 12 months' duration; except in the Soviet Union, 1-month familiarization visits are permitted. Expenses will be met by the academies. Deadline for submission of applications – to the Office of the Foreign Secretary (USSR/EE), National Academy of Sciences, Washington, D.C. 20418 – is 23 November, 1970."

7024. **Frutkin, A. W., "International Cooperation in Space"**, *Science,* **v. 169, no. 3943, 24 July 1970, pp. 333-338.** NASA's assistant administrator for international affairs discusses the Agency's efforts to support cooperation with other nations in the space programs of the United States in accordance with the Space Act of 1958. Thus NASA has "produced a wide range of projects in which significant

scientific, engineering, and funding responsibilities for space missions have been assumed by other nations." Cooperative programs discussed include numerous joint satellite programs with Canada, several South American countries, Mexico, many European countries, India, and Australia. In addition, some 16 countries are involved in the analysis of lunar surface samples gathered by Apollo missions. Over 50 countries receive daily weather data directly from U.S. weather satellites. The 10-nation European Space Research Organization is collaborating with NASA in international exchange of space information utilizing a common computer system. Limitations in cooperation stem from the low level of European space budgets and the reluctance (for political reasons) of the Soviet Union to collaborate with NASA in space ventures. "Openhanded efforts are currently under way to raise the level of foreign participation in the space programs of the next decade."

7025. Gruchow, N., **"U.S.-Soviet High Energy Exchange"**, *Science,* **v. 169, no. 3942, 17 July 1970, p. 263.** "In a new U.S.-Soviet exchange, a team of American high-energy physicists will travel to Russia this fall to collaborate with Soviet scientists in experiments with the particle accelerator at Serpukhov. As part of the exchange, two Soviet scientists have been participating in planning sessions since 21 June at our giant accelerator in Batavia, Illinois . . ." Negotiations had begun in 1966 "for cooperation between scientists at the world's three largest accelerators – at Batavia, Serpukhov, and the European Organization for Nuclear Research (CERN) near Geneva. The Soviets and Americans had previously conducted experiments in collaboration with CERN, but none with each other". Darrell Drickey (UCLA) will "lead five or six Americans who will be in the group that goes to Russia". Soviet physicists P. Ermolov and A. Mukhin are presently attending the six-week session at Batavia, "along with 38 other scientists from the United States, Canada, and CERN".

7026. **"Revamping Research and Development"**, *Science News,* **v. 98, no. 6, 8 August 1970, pp. 112-113.** The President's Defense panel completed a year-long investigation and presented its findings in a 237-page report. Its 113 major recommendations include (1) abolish the position of Director of Defense Research and Engineering, and replace this position "by three Assistant Secretaries to direct Research and Advance Technology, Engineering Development, and Test and Evaluation"; (2) establish a new independent Defense Test Agency to monitor all weapons testing; (3) establish a Net Assessments Group "to weigh United States defense capabilities against intelligence reports of potential threats and determine weapon needs prior to procurement approval"; and (4) create a Long Range Planning Group. "The consensus of some industry and Pentagon officials appears to be that if panel recommendations relating to

research, development, test and evaluation are acted upon, these functions will assume a more important role and provide more effective control in the future process of weapons procurement." Another recommendation of the panel is that "all new major weapon systems will undergo thorough and rigid testing prior to procurement; no longer will components of a major system undergo development concurrent with production. It was this concurrence policy that led to the huge cost overruns in such programs as the C-5A cargo plane. The panel's recommendations could go far to eliminate some of the embarassing aspects of Defense procurement, and indications are that the report is being taken seriously."

7027. **"Foster Testifies that U.S.S.R. is Closing R&D Gap"**, *Industrial Research,* **v. 12, no. 6, June 1970, p. 43.** Dr. John S. Foster, Jr., Director of Defense Research & Engineering, told the Senate Defense Appropriations Subcommittee that the U.S.S.R. and other countries are challenging U.S. technological leadership, which poses a threat to national security. He "noted that total Soviet R&D has been growing faster during the past decade than that of the U.S." and that "Soviet funding for military, space, and atomic energy R&D now is about $16- to $17-billion, while comparable U.S. funding is about $13- to $14-billion". Foster cited Japan "as an example of a friendly country striving hard toward 'technological parity' with the U.S."; it " 'is advancing almost spectacularly across almost the whole spectrum of advanced technology' ". To counter these trends, " 'the U.S. must move toward a much more vigorous commitment to national R&D, both of the military- and civilian-oriented types, upon which our long-term national technological position can be strengthened' ".

7028. **Goldhaber, S. Z., "CBW: Interagency Conflicts Stall Administration Action"**, *Science,* **v. 169, no. 3944, 31 July 1970, pp. 454-456.** "On 25 November 1969, President Nixon affirmed a U.S. policy of 'no first use' for lethal and incapacitating chemical weapons. He also renounced the U.S. use of any biological weapons, even in retaliation. Furthermore, he pledged to submit to the Senate for ratification the long-neglected Geneva Protocol of 1925, which binds nations to refrain from first use of chemical and biological weapons." While an official at the White House stated on 14 February "that all future biological warfare defensive research would be done on an unclassified basis", classified research is still carried out at both Edgewood Arsenal and the Dugway Proving Grounds. Ratification of the Geneva Protocol of 1925 pledging not to use noxious gases first continues to be delayed by disagreements on whether the use of tear gas and defoliants are "within the scope of the protocol". The House Subcommittee on National Security Policy and Scientific Developments "recommended that the tear gas and defoliant questions 'should be left open.' It suggested that, after Senate ratification, the United

States 'should seek agreement with the other parties on a uniform interpretation of the scope of the protocol'." Some groups outside the government favor ratification of the protocol including restraints on first use of tear gas and antiplant chemicals. "Critics, both inside and outside government circles, continue to be disenchanted with CBW policy. The discontent nourishes itself on Administration delays. If Nixon does not declassify defensive biological warfare research, and if he insists on a reservation to the protocol instead of leaving the tear gas issue open, he may lose much of the positive response that he received from his original CBW announcement."

7029. Dellenback, J., "CBW: The Scientific Community and Public Policy", *Congressional Record,* v. 116, no. 89, 2 June 1970, pp. E5037-E5038. The text of Mr. Dellenback's address to the Scientists' Committee on CBW in Atlantic City, 15 April, is presented. The results of a 1969 study "CBW and National Security" suggested that the disadvantages of chemical and biological weapons "far outweigh their marginal advantages" and led to the recommendation of the following actions: "(1) Eliminating all stockpiles of chemical and biological weapons, including any low-level chemicals designed for military use. This does not include riot control agents for crowd control in the U.S. (2) Publicizing the results of future research in the field of CBW. (3) Encouraging international agreements on the prohibition of chemical and biological production and usage. (4) Ratifying the 1925 Geneva Protocol. (5) Declaring that the United States will not use such weapons but will respond to their use by adversaries with appropriate conventional or nuclear force." The role of the individual scientist in forming political decisions on the technological advances which they have brought about is discussed and greater cooperation between government and the scientific community is urged.

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8079. Nanda, V. P., "Does Man Face Self-Destruction? – New International Agency Suggested as a Solution for Environmental Problems", *Congressional Record,* **v. 116, no. 104, 23 June 1970, pp. S9570-S9571.** The author discusses some international proposals and bilateral agreements which have been made for the purpose of alleviating the problems of air and water pollution, and recommends the establishment of a new international organization that would encompass regulatory measures and enforcement procedures that are not a part of most of the present agreements. Some of the agreements and proposals discussed are (1) The European Conference on Air Pollution's Declaration of Principles; (2) the U.S.-Canada International Joint Commission and the U.S.-Mexico International Boundary and Water Commission guidelines for preventing pollution in international waterways; (3) a treaty signed in 1965 for the protection of the Rhine, and (4) the efforts of maritime powers to combat pollution of the seas under the auspices of the U.N. International Maritime Consultative Organization. The author suggests that the following questions need to be answered before pollution can be satisfactorily abated: (1) Who is to institute corrective measures?; (2) Who is to pay?; and (3) What regulations, controls and machinery would ensure compliance? The establishment of a new international organization on the order of a special U.N. agency, a new type of international body, or a composite of many regional agencies is proposed.

8080. "International Institute for the Management of Technology", *Science Policy News,* **v. 1, no. 6, May 1970, p. 113.** The OECD Council will have before it this month the report of a working party recommending the establishment of the International Institute for the Management of Technology (INTIMT). "The thinking that has led to the creation of INTIMT is that during this decade there will be accelerated movement toward industrial integration in Europe and across the world. This will create an enormous growth in demand for managers with an international background; managers who regard the whole of Europe as a single entity and can think in terms of world-wide operations". The INTIMT is expected to begin operations in early 1971 in Milan, if the OECD grants approval, "which is likely". The staff will include the Director-General and 12 professors, each with four to five researchers. Utilizing the systems approach to managerial problems, the training programs "will consist of Advanced

Courses of from four to six weeks' duration for middle managers, short Appreciation Courses of two weeks or less for senior managers, and Comprehensive Courses of nine months or more for those newly entering, or recently entered, on their careers in management". "INTIMT is to be established by intergovernmental convention for an initial period of five years. Governments party to the convention, and companies, foundations and individuals from the private sector will constitute a General Council, responsible for policy and budget." Expenditures are estimated to be $1.5 million in the first 12 months of operation, $2.3 million during the second year, and approximately $3 million in the third and subsequent years. "This expenditure will cover material and personnel, including travel and accommodation costs." INTIMT will be financed primarily by governments and industry for the first five years, and at the end of that period it is expected to be sufficiently well established to be set up as an independent foundation.

8081. **Orski, C. K., "A Pilot Experiment in Technology Assessment – OECD Advisory Conference on Tunnelling", *OECD Observer,* no. 45, April 1970, pp. 12-14.** Policy guidance to governments is the primary objective of an OECD Advisory Conference on tunnelling as a means of relieving urban congestion and preserving decent urban living conditions. Present constraints on underground construction (high cost, long construction time, surface disruption, a fragmented excavation industry and social unacceptability) are discussed in the article. Questionnaire replies from 19 countries were used in the preparation of six major reports presented at the Conference – four on needed improvements in tunnel-construction technology, one on the status of R&D, and one on demands for tunnelling. This Conference "probably represents the first attempt to carry out a technology assessment on an international scale .... drawing on the combined knowledge and expertise of many countries in order to arrive at sounder, more balanced judgement about technological policy".

8082. **"Conference on Molecular Biology", *Science Policy News,* v. 1, no. 6, May 1970, p. 120.** "On 2 April 1970, the European Conference on Molecular Biology – an intergovernmental organization of European States – formally came into existence....At its first plenary session ... the following officers were elected: President (for one year), H. Voirier (Switzerland); Vice-President (for one year), A. Alline (France) and Dr. C. Zelle (German FR); Secretary-General (for three years), Dr. J. C. Kendrew (UK); Chairman of the provisional Finance Committee, A. Alline ... A scheme of activities for 1970-1974 was presented by Professor M. Eigen, President of EMBO (the European Molecular Biology Organization)." The net budget agreed to for 1970 amounted to $632,000, with a gross expenditure foreseen of $714,000. Of this, 5 percent is for the costs of the

Conference itself. The rest will be transferred to EMBO for the continuation of its work in arranging high-level study and training. The breakdown is as follows: fellowships, $524,000; courses and workshops, $76,000; management, $55,000. The ceiling for 1971 was provisionally set at a little less than $1 million, with indications of a 20 percent growth over the next two years. Contributions from Member States will be assessed on the basis of the net national revenue.

8083. *National Science Policies in Europe,* **Science Policy Studies and Documents, UNESCO, 1970, 489 pp.** This publication presents information regarding the science policies of 26 European nations. The information was provided "by governmental science policy bodies, during the same year 1969 and following the same general plan, thus providing a wide opportunity for comparing the experience of different countries". The bulk of the publication consists of descriptions of the science policies of the 26 nations; each national summary deals successively with the organizational structures for science policy, human and financial resources devoted to R&D, national science policy, and the international aspects of the policy. Preceding the national summaries is a general introduction which gives an overall view of the salient features of the national science policies. (This publication can be obtained from the UNESCO Publications Center, 317 East 34th St., New York, N. Y. 10016. Price: $9.50.)

8084. **Gunston, W. T., "Aviation: Collaborate or Perish",** *Science Journal,* **v. 6, no. 7, July 1970, pp. 74-77.** Examples of European international cooperation and noncooperation in aircraft design and technology are discussed and problem areas are broadly identified. One of the biggest problems of a collaborative program is "the natural wish of each partner to be the winner, or the design leader, or in some other way to be visibly the most important participant . . . The Concorde supersonic airliner and Jaguar multi-role tactical fighter and trainer have been models of cooperation in which BAC and two other French partners have worked virtually as a single team whilst overcoming the problems of language, metrication and contrasting material specifications". Other handicaps are mentioned: "The two or more partner countries are certain to require slightly different aircraft tailored to their own duties and environments. Both partners will probably wish to assemble complete aircraft . . ., transport costs must add a small percentage . . . Another penalty is that each partner has to 'ride herd' on the others so there is bound to be duplication in material or parts inspection. . ." The obvious advantage of cooperation is in the sharing of large research and development bills that might be too great a burden for a single country. The author comments that "there are good and bad ways of

launching major programmes and, in my view, the only good way is by paying much more attention to the market than to politics". He further suggests that full budgetary information should be available, contrary to the British practice of disclosing "nothing except when a political point could be scored by doing so. Little purpose is served by failing to produce a realistic cost figure at the start for fear of having the whole thing rejected by the Treasury." While it is allowed that some "national pride" might be lost in collaboration, " 'once you have overcome this emotional hurdle, the idea makes increasing sense' ".

8085. Gatland, K., "Space: High Ambitions, Low Budgets", *Science Journal,* v. 6, no. 7, 7 July 1970, pp. 77-79. Space accomplishments of the European countries and organizations are reviewed and prospective satellites, their origin, and function are tabulated. Proposed programs are discussed in relation to European and American collaboration and the effects of space collaboration on industry. ESRO, under the direction of Professor Hermann Bondi "is evolving as a centre for both scientific and applications satellites" and is now interested in developing satellites for meteorology, navigation, and air traffic control. "ESRO and NASA are examining the possibility of a joint programme which could be important for European industry. Less successful have been Europe's efforts to obtain independence in Satellite launching through the European Launcher Development Organization (ELDO)." ELDO is now asking support for Europa III which would place a 5-ton payload into low earth orbit or 700-900 kg into geo-stationary orbit. Since Britain has dropped the Blue Streak as first stage in favor of a new rocket by France, "this means retracing all the progress of the past decade . . .Meanwhile, the United States has introduced a new element into European deliberations by inviting collaboration in the post-Apollo programme (which has yet to be approved by Congress). . .So far the U.S. State Department has ruled against the purchase of American launch vehicles for European commercial ventures, such as the regional communications satellite. This could be changed by cooperation in the post-Apollo programme. Europe could reserve the right to buy boosters for any non-military application." Cost may be a problem, since all "the second league nations together spend approximately $300 million a year on space – an order of magnitude less than the United States and probably the Soviet Union. 'If other industrialized nations decide to allocate larger amounts of their resources to cooperative programmes', says Dr. Thomas Paine, NASA administrator, 'the way will be open for their participation in the development of large scale systems which we believe are going to pay important scientific and technological dividends in the future'." While collaboration may not save money, the idea of international collaboration may be more persuasive "than arguing the benefits of

science and technology which few politicians take the trouble to understand". However, "successful collaboration on this scale would require a strength of purpose that Europe has yet to find, a more aggressive approach to space as a whole, and much improved central management... The spin-off effects to industry would be far more direct than those stemming from the Apollo Moon-landing programme. Many functions of the space station would be related directly to Earth."

8086. Smith, K., "Making Sense of Electronic Components", *Science Journal,* v. 6, no. 7, July 1970, pp. 80-82. Domination of the electronic components market by American companies and possible countermeasures by Europe are discussed. New developments in semiconductor technology, particularly in the sector of integrated circuits, give American companies an estimated 60 percent of the European markets. "Tomorrow's computer will need vastly bigger memories than today's machines and costs will have to be very much less." The threat of domination by the United States is so great that British industries are being restructured. French industry is also reorganizing but so far, "has failed to produce a viable computer company. In Germany the same relentless industrial logic applies". Three basic solutions are discussed: (1) technical collaboration on a national scale, (2) international mergers under joint ownership, such as the Pirelli-Dunlop merger, and (3) cooperative mergers having different ownerships, with the "surrender of a certain amount of sovereignty...on the part of each company". Collaboration on a national scale may not yield a wide enough market base for European countries, while technological and financial collaboration among several European nations may produce larger markets and complete coverage of integrated circuit technology. The third alternative is currently being explored by Europe's Pan-European firm, SGS, initially set up by Olivetti in collaboration with Fairchild. "Now no longer collaborating with Fairchild, SGS is looking for technological partners...There may be drawbacks to this approach but the alternatives are even more daunting. Today big systems houses can carry their semiconductor operations even if they are losing money. In the future they will find it increasingly difficult to do so".

8087. Murphy, B., "Towards A European Computer", *Science Journal,* v. 6, no. 7, July 1970, pp. 82-85. "Such is the dominance of the Americans in the [European] market place that many people believe it foolish for the fragmented European industry to try and compete", but European competition is seen as essential. "In a recent OECD study, computers are cited as a key industry because of their widespread use in commerce, industry and government. In countries without large defence or space programmes, the computer industry can, moreover, provide a rallying point for scientific and

technological advance... Present estimates show that the growth rate of the European computer market over the next seven years will be greater than that of the North American continent. Before a significant portion of this market can be seized by European firms, however, it would seem ... that the various existing elements of the European computer industry must overcome their division into comparatively small units and form themselves into one or two major groups that can match their American competitors." The author proposes the rapid establishment of "a viable European organization... to seize a good share of the expanding market for itself". He suggests that two or three European companies organize "possibly along the following lines. First, an overall joint service company should be set up and owned by the participating companies. This would contain three main elements: a product planning group, a systems software group, and an information centre." Government cooperation is seen as essential, since governments "are the largest single customer for computer systems... The future of the European computer industry depends on urgent action being taken both by the industry and by governments."

8088. Mohrhauer, H., "Atomic Energy: Divide and Conquer", *Science Journal*, v. 6, no. 7, July 1970, pp. 85-88. Britain's entrance into the Common Market "confronts policymakers as well as scientists and industrialists in Britain with decisions about the future of Euratom". While Europe's present development of the atomic industry is seen as "unco-ordinated", "the scientific and technical potential is there and may pay off if co-ordinated properly". To the present "a score of types of different reactor systems has been developed... [and the] war of types seems finally to have come to an end" with wider use of enriched-uranium water-cooled reactors. Gas-cooled reactors, "run at higher temperatures (and therefore greater efficiency)" will probably comprise the next generation of atomic power stations. "While the development of an independent line of power reactors seems to be a matter of utmost national pride in most European countries, the provision of fuel for these reactors is fortunately dealt with in a much more rational way. Since no large uranium ore deposits exist within the boundaries of the Six, uranium is being purchased from suppliers around the world. To co-ordinate purchasing and pricing policy Euratom has set up a 'supply agency' through which all business in atomic fuel must be funnelled... For the future, two Continental countries, The Netherlands and Germany, together with Britain, have started to set up their own enrichment capacity." Extraction of unused uranium and plutonium from irradiated and exhausted fuel is a slow, even if simple, process and "not until the end of this decade will there be anything like sufficient irradiated fuel to justify large [reprocessing] installations in all European countries". At present, competition for the "small

amounts of fuel available" is "cut-throat . . . In this situation, the formation of a European reprocessing company. . . seems to be the only solution. However, once again, this would require that government and industry in the countries concerned should forgo arguments of national prestige and narrow minded commercial expectations."

8089. **"Science Cooperation Activity"**, *Science Policy News*, **v. 1, no. 6, May 1970, p. 119.** "Sometime after mid-June, there will be available the reports of seven expert working parties, the results of the work of 15 States (the Six and nine other European countries). These reports are for Europe-wide scientific and technological collaboration, and are to be the basis for a 15-nation ministerial conference later this year. The working parties cover the Aigrain group's projects for data-processing, telecommunications, new forms of transport, metallurgy, pollution, meteorology and oceanography. A seventh, special working party was set up for 'Project 70', a European computer centre for the exploitation of meteorological research. Pierre Aigrain is chairman of the working party on scientific and technological research policy of the Community's Medium-Term Economic Policy Committee which drew up the original co-operation proposals. These were transmitted to nine non-member countries in Europe in November 1969, after a Council decision on 28 October 1969. The nine countries are Austria, Denmark, Spain, Ireland, Norway, Portugal, the United Kingdom. Sweden and Switzerland. The council reserved the right to submit the proposals to other European non-member countries later. All the nine countries have agreed in principle to co-operate."

8090. **Jordan, L., "Scientific and Technical Relations Among Eastern European Communist Countries"**, *Minerva*, **v. 8, no. 3, July 1970, pp. 376-395.** A review and assessment of scientific-technical cooperation within the Soviet bloc is presented in this study. Starting from the late 1940's, the author describes and discusses the various cooperative efforts undertaken under the aegis of the Council for Economic Mutual Assistance (CEMA). He examines these efforts (which have included information exchanges, joint planning and research, bilateral arrangements, and joint R&D institutions) against the background of the political factors involved and the various policy shifts that have occurred. The author concludes that for "more than a decade the promotion and promise of scientific and technical cooperation has served as an important instrument of Soviet diplomacy in Eastern Europe. But the integration measures proposed by the Soviet Union. . .have tended to exacerbate the already existing friction over such issues as national economic development. . .and the limitation on nation sovereignty." Although collaboration offers certain advantages, cooperative efforts "have. . .met and are likely to continue to meet

the serious obstacle of the technological gap between the more advanced and less developed groups of CEMA countries".

8091. "Survey of Science in Europe", *Nature*, **v. 226, no. 5250, 13 June 1970, pp. 1009-1024.** This series of brief articles surveys the major opportunities, problems, and prospects of European science in the 1970's. It starts with an overview of needs and prospects for Western Europe *in toto*, then examines the status and prospects of the Aigrain proposals involving the Common Market countries, discusses the future of the European space agencies (ESRO and ELDO), and lastly surveys several of the individual European nations (U.K., France, Italy, West Germany, Netherlands, Poland, and Norway). [The individual articles comprising the series are reviewed separately in this issue of the Bulletin].

8092. "Uneasy Decade for Europe", *Nature*, **v. 226, no. 5250, 13 June 1970, p. 1009.** Some of the challenges and prospects for developing an integrated European scientific and technical community are discussed in this brief article. Crucial to this objective is "a radical reform of the European universities intended to make learning more accessible and scholarship more capable of sustaining its own development". Other needed measures cited include the development of "common research programs", the creation of a funding pool "for financing the movement of skilled research people from one place to another", and the development of common research facilities and service laboratories. Such efforts, it is suggested, can and should be undertaken outside the framework of the European Economic Community. These collaborative programs, moreover, should center on less spectacular and difficult areas than have been chosen in the past; "on the whole the best prospects are at the humdrum end of the scale".

8093. "The Six or the Fifteen?", *Nature*, **v. 226, no. 5250, 13 June 1970, p. 1010.** The status and prospects of the Aigrain proposals for European cooperation in advanced technology are discussed. The six Common Market countries and nine other European countries have been holding meetings since April to consider areas of technology for a concerted European effort; the areas now selected are computers, meteorology, oceanography, metallurgy, new methods of transportation, telecommunications, and pollution. The experts' reports on these seven areas will then be reviewed through some form of ministerial conference(s), and instruction will be issued to conduct studies of "the technical and financial aspects of those activities that appear likely to lend themselves to development on a European scale". The remainder of the article reviews some of the policy and procedural differences in approaches favored by the various nations, and briefly discusses the most "contentious" technology area

(computers) under consideration. It is concluded that the "more meetings there are to formulate a European policy for scientific and technical research the further away appears any decision likely to lead to any concrete outcome".

8094. **"Way Out of the Space Dilemma", *Nature*, v. 227, no. 5257, 1 August 1970, pp. 427-428.** As a result of the last European Space Conference (ESC), the Conference Chairman, M. Theo Lefevre, Belgium's research minister, will go to Washington "to seek clarification on whether the U.S. is prepared to launch operational applications satellites for the European Space Council... If so, on what financial and political terms? It was accepted almost without question that the chief aim of the ESC countries is jointly to pursue the development of applications satellites." Three satellites are described as having reached the project definition stage: (1) an air traffic control satellite for the North Atlantic, a 50:50 project between the European space organization and NASA, (2) the European telecommunications satellite, which "still awaits the establishment of common ground between the European postal authorities and the European Broadcasting Union, but it is shaping up for an initial systems-proving launch in the mid-1970s", and (3) a European weather satellite "perhaps to provide an in-space European contribution to GARP (Global Atmospheric Research Programme)... The chief question is, then, what is to launch these satellites? It is here that the Lefevre mission is crucial – and indeed forces the question why it has not taken place before." Elements to be considered are (1) confusion as to whether the U.S. would launch operational vehicles as well as scientific and research satellites, (2) the "American invitation to Europe to take on a sizable portion of the post-Apollo programme", and (3) "whether the American condition for launching European operational satellites during this decade may be a prompt undertaking by Europe to shoulder a substantial part of the post-Apollo programme... It was left that if the U.S. is not prepared to accommodate Europe's practical space ambitions for the next ten years, the British delegation would reconsider its position on supporting the Europa launcher."

8095. **Croome, A., "NASA Appeals for International Cooperation", *Science Journal*, v. 6, no. 5, May 1970, p. 11.** This is a British view of the implications of NASA's appeal for international collaboration on a proposed $10 billion, ten-year space shuttle program. Design concepts are not hardened and no contracts have been let, so non-U.S. participants would presumably have a chance to influence design and do part of the work. "The combination of open invitation and fluid programme definition has prompted suggestions that Europe should drop its floundering space programme and 'buy in' to the American." About 25 percent, or $250 million a year (including $60

million each from the UK, France, and Germany), is thought to be a large enough share to give Europe a real voice in the program. "Cynics are saying that the . . . invitation is a way of getting other countries to pay for a sizeable slice of a larger space programme than the States can now afford."

8096. "Ministeral Meeting on Space", *Science Policy News,* **v. 1, no. 6, May 1970.** "The British Minister of Technology, Mr. Wedgwood Benn, invited the French Minister of Industrial and Scientific Development, M. Ortoli, and the German Parliamentary State Secretary in the Science Ministry, Herr von Dohnanyi, to meet in London in April for a preliminary discussion of NASA's proposal for co-operation with European countries in its post-Apollo civil space programme. They agreed that the technical and financial implications needed detailed study; and that the response to NASA should be concerted between all the member countries of the European Space Conference."

8097. "ESRO's Big Chance, ELDO's Last", *Nature,* **v. 227, no. 5253, 4 July 1970, p. 2.** The European Space Conference in July is expected to "lay the groundwork for a solution of the knotty problems which have beset the European attempt to play a part in space". While ELDO's failures are "fresh in everyone's mind", ESRO's experience demonstrates that "the art of constructing small and medium-sized scientific satellites that work has been mastered". The American offer of a share in NASA's shuttle and space station plans presents an "awkward problem" and certain questions will have to be answered: "To begin with, they should ask what will be the justification for the space station that seems to be the kernel of the programme. Is it something that Europe could profitably have a stake in? Then has the project been properly appraised, for the space shuttle which is crucial to the space station concept will be breaking new and conceivably extremely hard ground in the aerodynamics of hypersonic flight? What part of the project will be the responsibility of Europe is also an important question... One estimate last week is that the minimum contribution if Europe is going to have any kind of say is fifteen per cent of the total cost, and this could come to two or three hundred million dollars per year. This will mean something like a doubling of what Europe spends altogether on space activities. An alternative would be to cut down on the national programmes, and individual ministers might like to think of that too."

8098. "Costs Fall, Hopes Rise", *Nature,* **v. 226, no. 5252, 27 June 1970, p. 1193.** Revamped plans for the CERN 300 GeV accelerator were unanimously supported at the CERN council meeting in Geneva. Impetus for the new plans has come from "rapid advances in superconducting magnets" and "developments in conventional

accelerator techniques... The most recent estimate for the cost of the accelerator is encouraging. Although the maximum energy will not be decided on until construction is well advanced, and even then will be capable of being increased, the cost of reaching 300 GeV with conventional magnets is now put at only 900 million Swiss Francs ($209 million)" which compares with previous estimates of 1,902 and 1,431 million Swiss Francs. "Substantial savings have been offered by proposing to site the new accelerator next to the existing CERN installations near Geneva." Some problems remain to be solved: "Permission has yet to be sought from France and Switzerland to site the accelerator near the existing establishment", and it is not "known how many governments will reaffirm their allegiance to the project... But the dramatic reduction in the cost of the new plans is likely to be a strong incentive not to jeopardize the project once again... The indications from the recent council meeting, at which all member states were represented, are that the prospects are bright." Professor W. K. Jentschke, from Austria, was elected as the "new director of CERN – excluding the 300 GeV project – from the end of 1970".

8099. "Physicists Collaborate at Serpukhov", *Science Journal,* **v. 6, no. 6, June 1970, p. 21.** "The experimental programme at the Soviet Union's new 70 GeV proton accelerator at Serpukhov is... providing many successful examples of international cooperation in the field of high-energy physics... The second of a series of experiments involving collaboration between physicists from the European nuclear research centre at CERN, and Soviet scientists of the Institute for High Energy Physics at Serpukhov, is about to begin on the Soviet accelerator. The experiment is an extension to higher energies of a long and successful project, begun at CERN some five years ago, involving a search for new fundamental particles produced in collisions between protons and negatively charged pions... Transporting the entire experimental set-up to Serpukhov's 70 GeV accelerator will enable the physicists involved to extend the search for new particles to still higher mass values; the experiment may also provide tests of the quark theory of particle structure, by checking for the existence of 'forbidden' quark-antiquark systems."

8100. "Britain, USSR Consider Joint Information System", *Industrial Research,* **v. 12, no. 5, May 1970, p. 49.** Discussions were held recently in Moscow toward establishing a "collaborative British/Soviet program for the study and development of information systems in scientific and technological fields. These discussions – the first of this nature ever to take place – have been arranged within the framework of the UK/USSR Technological Agreement. Subjects being explored include: research into techniques of information storage and retrieval; man-machine problems in information systems; and computer

production of abstract journals." The British side of the discussions was handled by representatives from the Institution of Electrical Engineers, the Ministry of Technology, and the Department of Education and Science; the Soviet delegates were led by the director of VINITI.

CANADA

8101. Doern, G. B., " 'Big Science', Government and the Scientific Community in Canada: The ING Affair", *Minerva,* v. 8, no. 3, July 1970, pp. 357-375. The rejected proposal to construct an Intense Neutron Generator (ING) is examined in terms of the roles and relationships between the Canadian government and universities in dealing with "big science". The ING proposal is itself described and the efforts and parties involved in its promotion and ultimate rejection are discussed. From this case study, the author concludes that the "ING affair illustrated the mutual distrust and conflict between academic scientists and governmental scientific bodies in matters of policy-making about research. It also revealed the inadequacy of the internal government of the Canadian universities for dealing with the questions raised by large-scale scientific research", and the "very rudimentary capacity of the Canadian scientific community to act in a concerted manner".

8102. "Introspection in Canada", *Nature,* v. 227, no. 5259, 15 August 1970, p. 658. "The fourth annual report of the Science Council of Canada . . . is a closely argued plea for a more rational approach to the use of Canada's scientific and technological resources, and. . .also points out some of the difficulties of living next to the United States. . . The central theme of the report is that economic growth should not be the sole yardstick by which a country's progress should be judged." Dr. O. M. Solandt, the council's chairman "suggests that there is a crucial need for Canada to find reliable indicators other than GNP which will provide a better measure of the country's progress towards achieving national goals. Only when such a yardstick can be found can a set of criteria be drawn up for judging the possible benefits of a new technology. . . Dr. Solandt argues that social scientists have a very great part to play in helping to weigh the costs and benefits of new technology. . . The chief effect of the proximity of the United States is the comparative ease with which American companies can penetrate Canadian markets and the ease with which Canada finds itself following American policies. 'If Canada began to show more independence both in policy and action, as it is now doing in the matter of pollution in Arctic waters', Dr. Solandt suggests, 'far from causing strained relations. . . it probably would increase U.S. respect for Canada and Canadians'." Some urgent needs brought out are (1) definition of goals for the Arctic and

mobilization of science and technology to achieve them, (2) remedies for the problems of poverty and pollution in the Arctic, (3) special aspects of urban research, including transportation, and (4) more involvement of industry in Canada's nuclear work, especially design.

8103. Doern, G. B., "The Political Realities of Science Policy-Making in the Federal Government", *Science Forum 15*, v. 3, no. 3, June 1970, pp. 21-25. Three structural options in science policy machinery in Canada are debated and analyzed: "creation of a Department of Science, creation of a minister of science policy, and improvement of the present Science Council-Science Secretariat structure". None of the three options are seen as ideal. A department created from bringing together different agencies would tend to be dominated " 'by its largest mission-oriented element'. The other components would not be 'so much co-ordinated, as submerged'." Furthermore, "it is precisely because science is supposed to be a means to help achieve a multiplicity of other departmental and agency goals that it cannot logically be housed in a single department". A minister of science policy (having no operational responsibilities) "would be politically weak, both in the sense of cabinet and interdepartmental and interagency bureaucratic power... The post is likely to attract a politician of very junior rank in the cabinet." A minister of science policy would be more effective in an inner cabinet system where "a group of senior ministers... would concern themselves with broad policy areas... Under such a system the criterion of high-status cabinet portfolios would change from those that stress size and budget to those that stress policy development and even 'planning' roles." The author states that "in spite of the tendency of the Treasury Board to have too short-term a view of things, I would even argue that under the existing form of cabinet organization, it would still be more likely to be more successful at making science policy than would either a minister of science policy or a Department of Science"... He further notes that "the French have attempted to develop some leverage by utilizing a 'budget envelope', and by developing improved statistics on research and development to fit *both* the long-run and short-run budget cycles. Precisely because the decisions are tougher for middle-sized countries like Canada, it seems to me that Canada must move more towards the French Model." The Science Council is urged to become "more competitive and politically agressive... Contemporary democracy appears to require that governments be willing to create their own critics. And bodies like the Science Council appear to be necessary to act as links between political executives, legislatures, and experts."

CUBA

8104. Roche, M., "Notes on Science in Cuba", *Science*, v. 169, no. 3943, 24 July 1970, pp. 344-349. Science in Cuba is characterized as

"immature", although "it is still too early for Cuban science to have produced many positive results. The fruitfulness of the considerable efforts now being made may only become apparent within the next 5 to 10 years." Obtaining accurate data on budgets and expenses was difficult: "The figure of 1.2 percent of the gross national product is given as the proportion of moneys invested in research and development in Cuba. On this basis, the scientific effort of Cuba would be, relatively, on a par with that of Canada and would be four to six times greater than the effort of the Latin American countries... that have given figures for their scientific investments. Cuban officials with whom I discussed this point shrugged off the figure as meaningless." While the author was told that there was no centralization of science and no explicit science policy, the effect of Prime Minister Fidel Castro's personal interest tended to be "the greatest single centralizing factor". The policy of higher institutions was "set directly or indirectly by him", and he does "not hesitate to reverse technical opinion when he feels that it is contrary to national interest". Career interest "in science and technology is stimulated quite early in education" and interest tends strongly to applications rather than to basic research. Present research leans heavily toward agriculture and animal studies. "In both biochemistry and physics, research endeavor is incipient and equipment is rudimentary... UNESCO is helping the Technological Faculty (University of Havana) and has given 2.1 million U.S. dollars to the project; the Cuban government has pledged 23 million pesos..." The Group for Energetics Investigation suffers for lack of large computers. "Evidently the U.S.S.R. has been unwilling or unable to supply a computer and most other sources are closed because of U.S. embargo. However, negotiations are under way with France to acquire a large computing facility..." There is postgraduate science study in Cuba being carried out in specialized laboratories. The Cuban Academy of Science is independent of the University and "is not interested in speculative or basic science but in practical results and in supporting the country's development. Many of the different groups are directly related to other academies in the socialist world through bilateral agreements, and often the foreign academies have provided men and equipment free of charge..." The status of the Cuban scientist is high in the community, though little information was available about salaries; the top figure for a first-year post graduate was given as 7200 pesos.

FRANCE

8105. Hardy, N., "Revamping Priorities: France's new five-year plan gives a boost to research and development", *Science News*, v. 97, no. 20, 16 May 1970, p. 492. France's new, sixth, economic plan for the period 1971 to 1975 "proposes significant changes in emphasis for

research and industrial development... An over-all 13 percent annual increase in budget appropriations... would bring the total funds for science to about $5 billion in 1975, amounting to nearly three percent of France's estimated gross national product for the year ....The report recognizes three general priorities: industrial development, life and human sciences and socioeconomic research... Top priority was given to industrial development... to improve France's competitive industrial position... The military budget, which normally increases three to four percent a year, will be cut about one percent, releasing a sizable sum for this effort to stimulate industry." Significant support will be given to the chemical, metallurgical and mechanical sectors of French Industry. "Atomic energy and information science will continue to be funded, but emphasis will also go to space and oceanography. The estimated 1975 figure for Government expenditures in aid to industrial development is $270 million to $360 million...a 10-fold increase over the $30 million amount for 1970." Life and behavioral sciences are "awarded a distinct priority over the physical sciences. The life sciences, including all areas of biology and medicine, will enjoy a 23 percent annual budget augmentation... The chief theme of the life-human sciences combination effort will be man-environment interaction. Particular effort will be directed against pollution...The plan also recommends measures to increase employment flexibility and mobility for scientists, engineers and technicians. The hope is to make research a much more attractive aspect of scientific employment... Another commission report is expected by the end of this year, outlining a program for execution of all these options."

8106. Hardy, N., "Uncertainty About Space: Budget cuts and doubts about European efforts have the French program in a tight situation", *Science News,* **v. 98, no. 6, 8 August 1970, p. 126.** "Fiscal restrictions imposed after the spring 1968 political-social upheaval have reduced the CNES (*Centre National des Etudes Spatiales*) operations and investments budget from $138 million in 1968 to less than $114 million this year. This is forcing significant reductions in operations and a reorientation of priorities and objectives... The CNES has been instructed by the Pompidou Government to concentrate on the applications aspects of its program and to de-emphasize fundamental space research. This downgrading of pure science in favor of income-producing industrial applications has, more than any other theme, characterized French science in the past two years... At the crux of the money question is the role of France's new launch center in South America [Kourou]... The advantages of Kourou's location near the equator are good selling (or renting) points in France's efforts to solicit foreign participation and cost-sharing for the center... The attempt to rent Kourou to the United States portends further cutbacks in the CNES budget for coming

years, cutbacks so severe that even contributions from ELDO and other cooperative projects could not cover the fund shortage... Just what part, if any, Europe can and will play in the post-Apollo program very likely will be the determining factor in planning of all future space programs in Europe, and particularly in ESRO, which may itself be reorganized or replaced... France and West Germany, fearing United States domination of European space efforts, are anxious to commit themselves and their somewhat unwilling sometime space partners to about $1 billion in future development costs." Théo Lefévre's report on discussions with the United States State Department concerning European participation in the post-Apollo space program "may provide the delicate impulses needed to tip the European space effort into harmonious orbit".

8107. **"Reshaping Proposed for France's Nuclear Agency"**, *New Scientist,* **v. 46, no. 703, 28 May 1970, p. 431.** "The French Atomic Energy Commission ought to be split up into four or five groups, but because of opposition from within the CEA itself this course of action will be impossible to carry through, reports a working party set up to examine the CEA after the recent strikes and general disruption of its work... In default, the report proposes that the High Commissioner should be replaced by a governing body that could call on scientific advisers when necessary, and that five autonomous directorates should be set up within the commission, dealing with nuclear weapons, power, basic materials, liaison, and fundamental research. The report makes it clear that the troubles which afflict the commission stem from the financial situation... The report admits that the commission is underemployed and overstaffed, and suggests that more subjects should be brought into its programme to remedy this, including water reactors, high-temperature reactors ..., fast reactors, reactors for the production of steam as well as electricity, and nuclear propulsion for ships... On the vital matters of money and man-power the report is silent, as they were not in the working party's terms of reference. The report has just been presented to the French government, which now has to decide whether to accept it and if so what action to take and when."

INDIA

8108. **Johnsen, K., "India Pushing for Own Space Capability"**, *Aviation Week & Space Technology,* **v. 92, no. 19, 11 May 1970, pp. 22-23.** "India is moving toward the establishment of a domestic satellite communications system and a capability to produce its own spacecraft and launch vehicles. The India satellite system, designated Insat, is scheduled to start operations in 1975-76. It would follow India's 1973-74 instructional television experiment with National Aeronautics and Space Administration's Applications Technology

Satellite (ATS-F). . . .Details of India's space program. . . were unveiled by Dr. Vikram A. Sarabhai, chairman of the Indian Space Research Organization (ISRO) and head of the Dept. of Atomic Energy. First phase of the program is to be accomplished in 1975, and the second phase by 1980." Highlights of the program are as follows: (1) **launch facilities**: Shri Harikota Island range under construction, Thumba Equatorial Rocket Launching Site completed in 1963, and the Space Science and Technology Center presently undergoing expansion; (2) **launch vehicles**: development goal of a Scout-type satellite launcher in about 4 years and development of a vehicle of the performance of Thor Delta and Atlas in the 1975-1980 period; (3) **ground stations**: an earth terminal near Poona will soon go into operation, a second major station near Delhi in about 3 years; and (4) **satellites**: three Insat 1 spacecraft, the prototype to be constructed within the next 3 years. While most of the components will have to be imported, India expects to produce components for the second-generation communications satellites "largely on our own designs. . . India's space plan is based on the premises that communications can be a major tool for development and are required for national integration." Basic features of Insat 1, resulting from studies with General Electric and Hughes, are described.

8109. **Ghaswala, S. K., "Progress in Nuclear Technology: India's power needs require research now in advanced techniques", *Science News*, v. 97, no. 18, 2 May 1970, p. 444.** The 400-megawatt plant at Tarapur, India "represents this country's first toddling nuclear step. Although the plant was built largely by and with United States aid. . . it has served to increase the Government's enthusiasm for more nuclear projects." To obtain nuclear self-sufficiency, a breeder reactor program would be necessary "to give India a viable atomic energy program in 20 years. To accomplish this goal, Dr. B. D. Nag Chaudhuri, member of the planning commission of the Indian Government, maintains that India should start right away with work of an advanced nature, not only on breeder reactors but related areas such as liquid metal coolants, ceramic fuel elements and sophisticated process-control instruments. This concept of plunging into new technologies – a concept often propagated but rarely acted upon – would not only give India a greater self-sufficiency, but also substantially increase the employment potential of engineers and scientists without any appreciable large-scale financial investment." Other projects include the agro-industrial complex and water desalination. In the agro-industrial complex, "nuclear power would desalt water from driven wells and power a 1.2-million-ton fertilizer plant and a 50-ton aluminum plant. . . It is estimated that the complex which would cover 1.5 million hectares would increase agricultural production by 22.8 million tons of food grains, producing a net income of $641 per hectare from the tilled land." In the water

desalination project, nuclear power, "although primarily envisioned for the flash-distillation process... could supply the energy for reverse osmosis to meet India's special needs... To insure that the country's nuclear technology continues to grow, nuclear research centers are envisioned. The major one in India is the Bhaba Atomic Research Center... 15 miles north of Bombay, where about 5,200 scientists and technicians are engaged in an all-out effort to develop industry, medicine, agriculture and power generation."

IRELAND

8110. Lee, M., "Ireland Seen as 'Economics Laboratory'", *Science Journal,* v. 6, no. 6, June 1970, pp. 4-5. Developments in Irish government agencies, universities, and industry are described, showing "a marked trend in the movement of manpower away from agriculture to industry". A National Science Council survey showed R&D spending in 1967 to be £6.49 million, which is almost double the 1963 figure but a constant percentage (0.5 to 0.6) of the gross national product. About half the research was government funded, mostly in agriculture, forestry, and fisheries. One of the arguments for substantial programmed increases in government funding of scientific R&D is that many well-trained scientists "are currently being forced to emigrate for lack of suitable employment". In addition to universities, some key institutions are (1) Regional Technical Colleges, which are planned to provide courses oriented toward the industries of the region; (2) the Agricultural Institute, largest of Ireland's research institutes; and (3) the Institute for Industrial Research and Standards, established "to help existing industry to maximum efficiency... and to investigate the use of natural resources [such as the sea] and exploit them to establish new and viable industrial employment". A target set by the National Science Council is to increase government funding of R&D to 1 percent of GNP by 1973 which, if attained "will mean an unprecedented boom for Irish science".

ISRAEL

8111. *National Science Policy and Organization of Research in Israel,* Science Policy Studies and Documents, No. 19, UNESCO, 1970, 68 pp. This report, prepared by the National Council for Research and Development of Israel, describes the nation's R&D system and associated science policy. Separate sections of the report present the historical development of the science organization of Israel; the present and proposed organization; information on the financing of scientific and technical research; training of academic and scientific

personnel; the principal aims of science policy (e.g., research areas, integration of science policy into the national plan); and the structure and machinery of government relevant to science policy. In addition, a comprehensive listing of research institutes and laboratories is presented as well as a bibliography of official Israel publications on plans for the development of research and inventories of scientific and technical potential. (The report can be obtained from UNESCO Publications Center, P.O. Box 433, New York, N. Y. 10016. Price: $1.50.)

8112. **Greenberg, D. S., "Israel; Research and Education Booming in a Nation at War", *Science,* v. 168, no. 3930, 24 April 1970, pp. 446-451.** Research and Education play prominent roles in Israeli life despite the "enduring state of hostilities". Its scientific strength is great for its size. "With 1/1400 of the world's population, it has been calculated, Israel produces 1/200 of the scientific papers... Israel's scientific prowess still shows up more in her scientifically managed citrus groves... than in her industrial plants." Research funds are a problem and "many possibilities are being explored and cultivated" both in Europe and America. Modern institutions are the heart of the research and education setup: the Technion, Hebrew University, The Weizmann Institute, the new University of the Negev. Growth of the academic and research enterprise is attributed to "traditional Jewish emphasis on education and science". Israeli student enrollment in higher education is high, comparable with percentages for Britain, France, and West Germany, though the average age of students is higher owing to compulsory military service. The emphasis in education tends to be on science and has prompted a closer look at science management. "At present, the focal point for government management of science is a 36-member body... The National Council for Research and Development (NCRD)... attached to the Prime Minister's office. It has many of the same study and advisory functions as the White House Office of Science and Technology, but in addition it administers a varied collection of research institutions and services that...are unattached to a regular government ministry..." As the result of a study last year, "the NCRD will be reconstituted as the National Research and Development Authority; it will drop its responsibility for running scientific organizations and confine itself to planning and advisory activities. As is the case with its American counterpart, its influence over budgets and programs will be a matter of advice rather than direct authority... Attempts are under way to put some planning authority into a body known as the Council for Higher Education, which currently functions as an accreditation organization, but hopes are not high. In this miniscule country, the universities rank high in role and influence. They have fared well under the present system, and are not eager for change."

ITALY

8113. Greenberg, D. S., "Italy: Political Turmoil Kills Plan for First Doctoral Program", *Science,* v. 168, no. 3932, 8 May 1970, pp. 683-684. "Plans for the Ph.D. program, titled the Studium, have been laid to rest" in the aftermath of a 38-day occupation of the International Laboratory of Genetics and Biology (ILGB) at Naples by left-wing researchers and technicians. "This is confronting the National Science Foundation (NSF) with a possibly historic event – the return of an untouched grant; the $486,000. . .was to have been the U.S. contribution to the Studium. . .ILGB's controversial, reformist founding director, Adriano Buzzati-Traverso, resigned last July and went to head up scientific affairs for UNESCO in Paris", and may be replaced by University of Rome's public health professor Thomaso Patrissi. "Elderly, impassive, and of no apparent political persuasion, he is credited by all with an even-handed, soothing approach to his duties. He is acknowledged to be there for the purpose of bloodless pacification, and not as a research administrator, an area in which he had had no experience." While there are arguments on both sides as to whether ILGB has been restored to scientific productivity, "many doubt that it will. They point out that Buzzati-Traverso is not easily replaceable; that the embrace of the University of Naples could easily be fatal [ILGB is now under the administration of the "fuedalistic" University of Naples], that several NRC [Italian National Research Council]-supported basic biology laboratories in the Naples area have lately been showing scientific strength; and, finally, that the radical left is less concerned with the scientific future of ILGB than it is with far more grand political goals. . . But, with the government in Rome just emerging from one of its repeated breakdowns and with NRC in a sort of limbo, with a president whose term expired over a year ago, uncertainty is the dominant theme."

Current Science Policy Publications:

(1) Accademia Nationale dei Lincei, Technologia avanzate e loro riflessi economici sociali e politici – Atti Convegno – Roma (Advanced technologies and their economic, social and political implications – Congress Proceedings), Accademia Nazionale dei Lincei, 5-11 November 1969, Rome, 120 pp.

(2) Ageno, M., Ricera scientifica e sprechi (Scientific Research and waste) – Relazione al Seminario sulla organizzazione e programmazione della ricerca (Report delivered at the Seminar on the organisation and programming of research), Consiglio Nazionale delle Ricerche, Pugnochiuso, 5-9 November 1969.

(3) Bisogno, P., Ricerca e servizi scientifici pubblici (Research and public scientific services), Relazione al Seminario sull'organizzazione e programmazione della ricerca, Consiglio Nazionale delle Ricerche, Pugnochiuso, 5 September 1969, p. 5.

(4) Bisogno, P., Programma di sviluppo dei servizi di documentazione ed informazione delle Stazioni Sperimentali per l'Industria (Programme of the development of documentation and information services in the Experimental Research Stations for Industry), Quaderni della Ricerca Scientifica, no. 54, Consiglio Nazionale delle Ricerche, Rome, 1969, p. 129.

(5) Buzzatti Traverso, A. – Criteri e mezzi d intervento per l'organizzazione della ricerca scientifica (Criteria and means of action for the organisation of scientific research), Relazione al Seminario sull'organizzazione e programmazione della ricerca (Report delivered at the Seminar on the organisation and programming of research), Consiglio Nazionale delle Ricerche, Pugnochiuso, 5 September 1969, p. 13.

(6) Cacace N., L'innovazione dei prodotti nell'industria Italiana (The innovation of products in Italian industry), Consiglio Nazionale delle Ricerche – ISRIL., Rome, 1969, p. 168.

(7) Cacciapuoti, L'organizzazione della ricerca in alcuni paesi europei ed extra europei (The organisation of scientific research in some countries inside and outside Europe), Relazione al Seminario sull'organizzazione e programmazione della ricerca (Report delivered at the Seminar on the organisation and programming of research), Consiglio Nazionale delle Ricerche, Pugnochiuso, 5 November 1969, p. 30.

(8) Confederazione Generale dell'Industria Italiana, La spesa per la ricerca scientifica nelle imprese industriali private (Expenditure on scientific research by private industry), Vol. 1 (1965-1967), Rome, 1968, p. 128; Vol. 2 (1967-1968), Rome, 1969, p. 130.

(9) Consiglio Nazionale delle Ricerche, Relazione generale sullo stato della ricerca scientifica e tecnologica in Italia – 1969 (General report on the situation of the scientific and technological research in Italy – 1969), Rome, 1969, Senato della Repubblica, V Legislatura, Doc. XIII, no. 2, p. 104.

(10) Cortellessa, G., Dialettica tra organi politici ed organi tecnici (Comparison of approaches between public and technical bodies), Relazione al Seminario sulla organizzazione e programmazione della ricerca (Report delivered at the Seminar

on the organisation and programming of research), Consiglio Nazionale delle Ricerche, Pugnochiuso, 5-9 November 1969.

(11) De Cesare, G., Il ruolo del C N R nel contesto dell' organizzazione scientifica italiana (The function of the National Research Council within the Italian Organisation of Science). Relazione al Seminario sull'organizzazione e programmazione della ricerca, Consiglio Nazionale delle Ricerche, Pugnochiuso, 9 November 1969, p. 4.

(12) Ente Nazionale Idrocarburi (ENI), Bilancia dei pagamenti technoligici italiana (Italian technological balance of payments), 1963-1967 and 1968, ENI, Rome, 1969, p. 120.

(13) Federazione delle Associazioni Scientifiche e Tecniche (FAST), La collaborazione fra la ricerca universitaria e la ricerca industriale in Italia (Cooperation between the University research and industrial research in Italy). FAST, Rome, 1969.

(14) Gennaro, P., Le scelte di politica scientifica in una logica di programmazione (The choices of science policy in relation to planning). Relazione al Seminario sulla organizzazione e programmazione della ricerca, Consiglio Nazionale delle Ricerche, Pugnochiuso, 5-9 November 1969.

(15) Imprese a Partecipazione Statale (La Ricerca Scientifica per LE) (Scientific research in undertakings with state participation), La documentazione italiana, no. 19, 1969, p. 24.

(16) Ministero dei Lavori Pubblici (La Ricerca Scientifica per IL) (Scientific research in the Ministry of Public Works), La documentazione italiana, no. 3, 1969, p. 31.

(17) Ministero della Difesa (La Ricerca Scientifica Del) (Scientific research in the Ministry of Defence) La documentazione italiana, no. 25, 1969, p. 46.

(18) Ministero Dell'Industria e Stazioni Sperimentali (La Ricerca Scientifica Del) (Scientific research in the Ministry of Industry and the Experimental Research Stations) in La documentazione italiana, no. 26, 27, 28, 1969, pp. 28, 30, 32.

(19) Ministeri della Pubblica Instruzione e dell'Interno e della Marina (La Ricerca Scientifica, DEI) (Scientific research in the Ministries for Education, for the Interior and for the Navy), La documentazione italiana, no. 33, 1969, p. 28.

(20) Instituzione del Ministero della Ricerca Scientifica e Tecnologica, in Atti del Sanato V Legislatura, no. 154. (The establishment of a Ministry of Scientific and Technological Research).

(The above list of publications was obtained from *Science Policy News*, v. 1, no. 6, May 1970).

JAPAN

8114. *White Paper on Science and Technology: Science and Technology for an Affluent Society,* **Science and Technology Agency, Japanese Government, March 1970, 76** pp. This report describes the trends and prospects for science and technology in Japan. It first discusses the contributions that science and technology are expected to make to economic and social development, and then it describes areas (atomic energy, space, and marine resources) in which Japan plans to place a major emphasis. Following this, trends in scientific and technological activities are reviewed in areas such as research, scientific and technical information, international cooperation, and technological exchanges and patent application. Finally, aspects of the government policy toward science and technology are reviewed; these include financial resources devoted to R&D, research activities of government agencies, and aid to the private sector. (The report is available from the Science and Technology Agency, Office of the Prime Minister, 3-2-2 Kasumigaseki, Chiyoda-ku, Tokyo, Japan.)

8115. **"Spending on Research, 1968-9"**, *Science Policy News,* **v. 1, no. 6, May 1970, p. 115.** "In December 1969, the Statistics Bureau of the Prime Minister's Office produced a survey on scientific and technological research spending. It was based on a study of 13,400 organisations including 11,500 capitalised at more than Y1m. (£1,150), 800 university departments and 1,000 governmental, public and private research institutions, but how the term 'private' enters into the survey title is not entirely clear. Total expenses for scientific and technological research of major Japanese corporations was Y877,500m. (£1,003m.), of which Y767,800m. (£877.5m.) was in the field of natural science. The total outlay for scientific and technological research in 1968-9 was 24.9 per cent up on that of the year before, the sharpest rise since the 30.7 per cent in 1961-2. Research expenditure is going up faster than the national income. Of the total outlay, corporations account for 57.5 per cent, research institutions for 13.1 per cent, and colleges and universities for 29.4 per cent. Research outlay for the electrical engineering industry accounted for 24.9 per cent of the total (a 46.6 per cent rise), and for the chemical industry 22 per cent (a 21.4 per cent rise). The ratios of research expenses to sales were highest in the pharmaceutical industry at 3.02 per cent, the communications industry (electronics

and electronic measuring instruments) at 2.91 per cent, and the electric machinery appliances industry at 2.27 per cent. The number of research workers in 1968-9 was 199,000, almost the same as a year earlier. Research workers in industry form 1.3 per cent of the total or 1.6 per cent of the total in the manufacturing sector. The ratios are below those of the U.S., but somewhat better than those of the UK, and much better than for France and West Germany. The money spent per research worker in Japan is about three-eights that of the Western advanced countries."

8116. **"Politics of Japanese Science"**, *Science Journal,* **v. 6, no. 5, May 1970, pp. 79-80, 83.** A descriptive history of science and technology in Japan is presented, including the operation and political interplay between the government's Science and Technology Agency (STA) (with its national institutes, semiprivate development corporations, and research agencies) and the Science Council of Japan (with its 60-odd university-based research institutes). According to the author, increased barriers to the importation of technology from other countries are spurring Japan to build up its own R&D capabilities on a large scale. Planned expenditures on science and technology for the current year are £1160 million, three fourths of which will come from industry (unlike other countries, where the government provides the bulk of the R&D money). There is a strong rivalry between the university-based research institutes and the STA's national institutes, and "open hostility . . . between large sections of the scientific community and the government". The resulting mutual distrust has limited the effectiveness of the academic community "as a source of advice at high levels of science policy". An STA white paper points out that the development of an indigenous technology is an urgent task. "The time is ripe . . . for more social sector science . . . [to deal with] 'traffic accidents, congested traffic, air and water pollution and noise . . . adult diseases . . . dietary habits, safety and sanitation, prediction of earthquakes, torrential local rains, earthquake proof and fire proof buildings' . . . It remains to be seen whether Japan's politicians are in a mood to listen to the good advice of the country's science policy planners."

8117. **Griffin, S., "Japan Asks for Help"**, *Science News,* **v. 97, no. 21, 23 May 1970, p. 97.** This is a brief review of Japan's "ambitious plans" for space activities, which call for the expenditure of over $1.3 billion during the decade ending in March 1978. To shorten development time, the Japanese Science and Technology Agency (STA) is permitting industry to utilize U.S. technology in the development of needed rockets. For example, Mitsubishi TRW is getting help from U.S.'s TRW, Inc., in the systems design of the Q-rocket for launching an observation satellite; Nippon Electric is being assisted by Honeywell, Inc. on the guidance system; and

Mitsubishi Electric has approached a number of U.S. aerospace firms for help in developing the satellite. Other names that have been linked (possibly for work on the followup N-type rocket) are: Tokyo Shibaura, Ishikawajima-Harima, and Mitsui and Co. with Martin Marietta, General Electric, and Aerojet-General; Kawasaki Heavy Industries with Lockheed Missiles and Space Co.; and the Mitsubishi Group with McDonnell Douglas Aircraft.

NETHERLANDS

8118. **"Government Policy on Environmental Quality"**, *Science Policy News*, **v. 1, no. 6, May 1970, p. 116.** Environmental problems in the Netherlands are described, along with government regulatory actions intended to combat them. The 1968 Air Pollution Bill provides for a Council on Air Pollution "to advise the Minister of Social Affairs and Public Health . . . on the . . . policy and on the execution of this Bill". The approach is to formulate separate legal regulations for water-, soil-, and air-pollution control and then to integrate them into an environmental health code. The booklet *Environmental Health in the Netherlands* by Prof. Dr. W.F.J.M. Krul, "is obtainable on request" (presumably from the Office of the Minister of Social Affairs and Public Health in The Hague).

Current Science Policy Publications:

(1) Central Bureau voor de Statistiek (Central Bureau of Statistics), Speur- en ontwikkelingswerk in Nederland 1967 (Research and development activities in the Netherlands in 1967), Staatsuitgeverij, The Hague, 1969, 81 pp.

(2) Diepenhorst, I. A., Universiteit en Wetenschap in beweging; punten van wetenschapsbeleid (University and science in transition; topics of science policy), Samsom, Alphen a/d Rijn, 1969, 267 pp.

(3) Ontwikkeling, De, van FOM; rapport naar aanleiding van de financiële situatie januari 1969 (The development of the Foundation for Fundamental Research on Matter; statement in connection with the financial situation in January 1969), Utrecht, 1969. 16 pp. Free.

(4) Pair, C. le, Coördinatie van het wetenschapsbeleid in de natuurkunde (Coordination of science policy in physics), Universiteit en Hogeschool, v. 16, no. 2, 1969, pp. 113-123.

(5) Tromp, Th. P., Enkele aspecten van de technische en industriële ontwikkeling: verleden, heden, toekomst (Some aspects of

technological and industrial development: past, present and future), Economisch-Statistische Berichten, v. 54, no. 2726, 1969, pp. 1284-1287.

(6) Vetenschapsbudget – 1970 (Science Budget – 1970), Staatsuitgeverij, The Hague, 1969, 52 pp.

(The above list of publications was obtained from *Science Policy News*, v. 1, no. 6, May 1970).

NORWAY

Current Science Policy Publications:

(1) Royal Norwegian Council for Scientific and Industrial Research, Annual Report 1969, Oslo, 1970.

(2) The Norwegian Council for Science and the Humanities, The Agricultural Research Council for Norway and the Royal Norwegian Council for Scientific and Industrial Research, Norsk forskningsvirksomhet – Utgifter og arsverk 1968 (Norwegian Research Activities – Expenditures and Man-years, 1968), Oslo, June 1970.

(3) Royal Norwegian Council for Scientific and Industrial Research, Industriens investeringer i forsknings- og utviklingsarbeider 1968. En statistisk undersokelse (Industry's investments in research and development 1968. A statistical survey), Oslo, 1970.

(4) Royal Norwegian Council for Scientific and Industrial Research, Innstilling om opprettelse av NTNF komité for teknisk informasjon og dokumentasion (Proposal to establish an NTNF Committee on technical information and documentation), Oslo, 1969.

(The above list of publications was obtained from *Science Policy News*, v. 1, no. 6, May 1970.)

POLAND

8119. *National Science Policy and Organization of Research in Poland,* **Science Policy Studies and Documents, UNESCO, 1970, 126 pp.** This study, prepared under the direction of the Polish Academy of Sciences, presents descriptive information and statistical data on Poland's R&D policies and practices. Successive sections of the study deal with the historical background of the scientific development in Poland, the organizational and institutional aspects of Polish R&D,

financing of research, human resources devoted to research and higher education, objectives and priorities of the national science policy, and the political structure and basic socio-economic data. Annexes present listings of higher education centers, scientific institutions and learned committees of the Polish Academy of Sciences, research laboratories, and engineering offices. A 70-item bibliography is also included. (This publication can be obtained from the UNESCO Publications Center, P.O. Box 433, New York, N.Y. 10016. Price: $3.00.)

SWEDEN

8120. **"Environmental Protection Legislation"**, *Science Policy News*, v. 1, no. 6, May 1970, pp. 116-117. Sweden has established an Environmental Franchise Board and enacted legislation (effective mid-1969) requiring users of real estate to "take protective measures, accept limitations . . ., and observe the additional precautions" deemed necessary to prevent continuing damage to the environment (from air or water pollution, noise, vibrations, light, or similar causes). The law requires an operating license for new "installations which will have a disturbing effect on the environment" or for certain alterations in existing installations. There is a clause which permits environmentally detrimental operations under special circumstances, "for example, when there is a clear utilitarian advantage to society or to individuals in continuing the operations, for instance if serious unemployment were the alternative". The Environmental Franchise Board deals with licensing and "should be regarded as an impartial arbitration tribunal". The law defines procedures for dealing with claims against environmental disturbances and penalties for convicted violators.

Current Science Policy Publications:

(1) Weinberg, A. M., Some observations on the formulation and practice of science policy, Teknisk vetenskaplig forskning, v. 40, no. 6, 1969, pp. 243-250.

(2) Ohlin, G., On 'over-research' and 'under-research' in innovation industries, Teknisk vetenskaplig forskning, v. 41, no. 1, 1970, pp. 4-7.

(3) Utvecklingslinjer inom forskning ock teknic 1919/2019 (Pattern of development in research and technology 1919/2019). IVA-meddelande 161 (Report from the Swedish Academy of Engineering Sciences), Stockholm, 1969. 220 pp.

(4) Styrelsen för teknisk utveckling. Verksamhetsberättelse 1968/1969 (The Swedish board for technical development. Annual report 1968/1969), Stockholm, 1969, ca. 100 pp.

(The above list of publications was obtained from *Science Policy News*, v. 1, no. 6, May 1970).

SWITZERLAND

8121. **"Environment Problems"**, *Science Policy News*, v. 1, no. 6, May 1970, p. 117. An Interior Department report (*Die schweizerischen Umweltprobleme und die bisherigen Anstrengungen zu deren Bewältigung*), under the Swiss Science Council on environmental problems and efforts to overcome them, reveals that Switzerland is suffering from environmental damage – notably water pollution and noise – along with the large industrialized countries. As of early 1969, on the order of Sw. Fr. 5 billion had been committed to purification plants and "canalisation work" to overcome water pollution. The report includes a brief description of legislation dealing with environmental damage and concludes that workable international agreements are needed for really effective control.

TURKEY

Current Science Policy Publications:

(1) Scientific and Technical Research Council of Turkey, Science Policy, 1969 Arastirma ve Gelistirme Harcamalari (Research and Development Expenditures 1969), Unit BPU/AT/1969.

(2) Scientific and Technical Research Council, TBTAK Faaliyet Raporu 1968-1969 (Scientific and Technical Research Council Activity Report 1968-1969), Ankara, April 1969, 244 pp.

(3) Scientific and Technical Research Council of Turkey, Ankara, A list of Science Manpower in Fundamental Sciences in Turkey, August 1968, 38 pp.

(4) Cankocak, Güleren, Türkiye Bilimsel ve Teknik Arastirma Kurumunun Bes Yillik Faaliyetlerinin Degerlendirilmesi Hakkinda Ön Rapor (A preliminary Report on the Evaluation of the Activities of the Scientific and Technical Research Council of Turkey during the Last Five Years), The Scientific and Technical Research Council of Turkey, Science Policy Unit, Ankara, February 1969, 70 pp. text, 28 pp. appendixes.

(The above list of publications was obtained from *Science Policy News*, v. 1, no. 6, May 1970).

UNITED KINGDOM

8122. **Miller, L., "Conservative Approach to Science", *Science News*, v. 98, no. 5, 1 August 1970, p. 102.** This article speculates on the effects of Britain's change to a Conservative Government on the country's use and administration of science and technology. The author believes that, in spite of its declared nonintervention policy, the new Government will be obligated to see that a minimum necessary amount of scientific expertise is made available to those industries that lag behind. He predicts "a slimming of present [Government research] establishments", including abortion of the outgoing Government's proposed British Research and Development Corp., and perhaps the demise of "the giant Ministry of Technology [$540.7 billion annual budget] itself . . . A previously tried formula might well be tried once again. In this, industry would help itself to science and technology through the medium of the Research Associations [financed from grants and industry levies], and . . . gaps . . . would be filled by the Government."

8123. **"What Mr. Heath Should Do", *Nature*, v. 226, no. 5252, 27 June 1970, pp. 1185-1187.** Speculations are presented as to what changes will be made by the new Conservative British Government in the objectives and organization of science and technology in England. The author states that "no doubt the Ministry of Technology will come at the top of the list of agencies ready for reshaping". He questions the fates of the defense-oriented government research establishments, the Atomic Energy Authority, and the research associations. He suggests that the new government critically reexamine existing commitments in such fields as nuclear power, telecommunications, and aircraft. With regard to cooperation within the European Economic Community, the author laments the "monumental waste of resources" resulting from all members working on similar things for fear of being left out of technical developments, instead of specializing and providing markets for one another's products. In education, the writer believes that there is a real danger that the Conservatives will neglect the "comprehensive schools which have sprouted in the past few years" to provide much needed high school educations for the masses. In research, "there is a case for hoping that the Science Research Council can be given more leverage". Also, "a start should be made on . . . integrating the university systems of Western Europe, in research as well as teaching". The article concludes with an admonition to the new Government to disbelieve the "fainthearts" who protest that technology inevitably leads to disaster. "There is no reason why it should not combine a vigorous defence of the quality of British life with an old-fashioned belief that technical advance is a virtue."

8124. **"Axe Over Science Committee"**, *Nature,* **v. 227, no. 5255, 18 July 1970, p. 217.** The Select Committee on Science and Technology, set up by the Labor Government, is likely to be dropped by the new administration, according to this article. It was "caught by the election in the middle of an enquiry" into the computer industry, but the testimony "will be made available to whatever committee system the House of Commons eventually adopts". This move "will in fact mean that science and technology will receive even less attention in Westminster than they do at present. The removal of many scientists and technologists from the corridors of power by the election has left the House of Commons desperately short of people interested in scientific affairs."

8125. **Greenberg, D. S., "Academic Finance: British System Smoothly Functions in 50th Year"**, *Science,* **v. 169, no. 3946, 14 August 1970, pp. 658-660.** The British system of support, administered through the University Grants Committee (UGC), for its 45 universities is described. "Consisting at present of a full-time chairman, 20 or so part-time members drawn from education, research, and industry, and a professional staff of about 35, it [the 50-year-old UGC] is not a statutory body and there is no law underlying its existence . . . It allocates funds [about 75 percent of all university financing] on a 5-year basis, with provisions for meeting increased costs and unforeseen problems. The current annual sum is $640 million . . . [exclusive of] earmarked research support that is provided by a separate system of research councils". Though only 15 percent of the British university-age population is enrolled (compared to 50 percent in the U.S.), the number is growing rapidly. A university education is virtually assured to any secondary-school graduate with passing grades in at least two broad subject fields.

8126. **"Britain Organizes to Fight Pollution"**, *Industrial Research,* **v. 12, no. 5, May 1970, p. 49.** A Royal Commission on Environmental Pollution has been set up to advise the British government on all matters relating to pollution. Other antipollution measures announced by Prime Minister Wilson include (1) preparation of legislation to control pesticides, (2) establishment of an advisory council on noise, and (3) formation of a permanent central scientific body under the Ministry of Local Government and Regional Planning to assist the secretary of state in coordinating government antipollution action.

8127. **"British Industry Cold to Nationalized R&D"**, *Industrial Research,* **v. 12, no. 6, June 1970, p. 49.** The proposed British Research Development Corp. (BRDC), linking government research establishments, the Atomic Energy Authority, and industry in a cost-sharing R&D effort, is denounced by the Confederation of British Industry (CBI). CBI members argue that the 20-fold increase

in their R&D expenditures for work to be carried on by the BRDC "is outside the normal pattern found in industry and comes at a time when many UK companies contemplate cutting R&D expenditures... in favor of education and training programs.... Some firms are cutting or stopping their subscriptions to corporate industrial research associations... [some of which] will have to curtail their activities or close down altogether for lack of funds".

Current Science Policy Publications:

(1) House of Commons Paper 365, Natural Environment Research Council. Report of the Council for the year 1 April 1968 - 31 March 1969, Her Majesty's Stationery Office, London, December 1969, 116 pp., illus., 10s. 6d. (SBN 10 236569 5).

(2) Ministry of Technology, Industrial Research and Development in Government Laboratories, A New Organisation for the Seventies, Her Majesty's Stationery Office, London, January 1970, 20 pp., 2s. 6d (SBN 11 470068 0).

(3) Foreign and Commonwealth Office, Molecular Biology, Miscellaneous no. 2, 1970, Agreement establishing the European Molecular Biology Conference, Geneva, 13 February 1969, Her Majesty's Stationery Office, London, February 1970, 12 pp., 1s. 9d. (Cmnd. Paper 4299) (SBN 10 142990 8).

(4) Science and Technology Select Committee 1968-69, Observations by HM Government on the Second Report (House of Commons Paper 213) on 8 December 1969, Defence Research (Cmnd. Paper 4236), Her Majesty's Stationery Office, London, 2s.

(The above list of publications was obtained from *Science Policy News*, v. 1, no. 6, May 1970.)

U.S.S.R.

8128. "Problems of Application", *Nature*, v. 227, no. 5255, 18 July 1970, p. 220. This article discusses some shortcomings in the operation of the numerous small research institutes throughout the Soviet Union, as viewed by the director of one such institute and reported in *Pravda* (7 July 1970). "Mostly they are local institutes financed by the relevant ministries and government departments of industry, agriculture and civil engineering", and doing highly specialized applied research. The problems are largely administrative, stemming from attempts to run huge and tiny institutes in an identical manner. Capital costs and wages are usually fixed by a government research plan, while "all other activity... must be

financed by the department concerned". This dual authority causes "practical difficulties" in small institutes. Support of applied R&D by contracts financed from a centralized fund under a ministry's plan leads to inefficiency because the work is not necessarily responsive to industry's needs. "A better scheme . . . would be that the central authorities should continue to support basic research, but that all R and D contracts should be settled between the institutes and the enterprises concerned."

8129. **Gatland, K., "Russians Move Slowly Towards Space Station; Record Flight in *Soyuz 9* Points Way", *Science Journal*, v. 6, no. 8, August 1970, pp. 5,7.** "Russia's bid to establish a permanent space station in Earth orbit took another step forward between June 1-19 when Colonel Andrian Nikolayev and flight engineer Vitaly Sevastyanov performed a record-breaking flight of 424 hours 59 minutes in the spacecraft *Soyuz 9* . . . Although a wide range of engineering tests and scientific observations were performed during the flight, major emphasis was on bio-medical problems of weightlessness and post-flight adaptation to normal terrestrial conditions." Indications that the cosmonauts' systems were slow in readapting to normal gravity prompted their doctor to suggest that "it might yet be necessary to create artificial gravity in permanent space stations and spaceships on protracted journeys to the planets . . . *Soyuz* has been described as 'a prototype space bus able to accommodate three cosmonauts in comfort and to commute with ease to orbital stations, disembarking and taking on passengers through a forward hatch' . . . How rapidly Russians advance to this goal depends on many factors, not least the perfection of the new launch vehicle."

WEST GERMANY

8130. **"W. Germany Sets Up Oceanographic Agency", *Industrial Research*, v. 12, no. 8, August 1970, pp. 33-34.** The new West German Commission for Oceanography, with representatives from the Federal Ministry of Science, the Max Planck Institutes, the German Research Association, and a variety of public-sector research groups, has been allocated $97.2 million in federal funds for oceanographic research through 1973. This is supplemented by $21 million from West German provincial governments. Critical of the "heavy emphasis on basic oceanographic research and a glaring lack of industry-oriented projects", West German companies from assorted industries formed The Economic Association for Industrial Sea-Engineering (EAISE), which now has 30 members. Both EAISE and the Commission for Oceanography are working toward (1) "exploiting the reserves of potential food resources locked up in the oceans", (2) "mining the ocean and ocean floor to obtain minerals and ores", and (3) "protecting the ocean from pollution and fighting pollution where it already exists".

8131. **"W. Germany Sets Up 'Think Tank' "**, *Industrial Research*, **v. 12, no. 6, June 1970, p. 50.** The nonprofit West German Research Institute for Technological Development Guidelines (ITE, from the German title) is described. Created last year by 55 companies, it has no laboratories and "its main tasks are to collect, collate, and analyze existing material to come up with general guidelines for company policymakers... ITE's projects are selected and directed by a 'research council' which is composed of members of the association's 20-man board of directors, governmental officials responsible for allocating funds for public-sector research, and representatives from other research bodies." ITE's funds come entirely from assessments of its members. Its first-year budget of $306,000, augmented by some company-donated manpower, is earmarked for three projects: (1) "city planning and transportation systems;" (2) "trends in the application and working of various materials;" and (3) "data for long-term economic development projections".

Current Science Policy Publications:

(1) Picht, Georg, Eine europäische Wissenschaftspolitik (A European science policy), 'Tempus' Zeitungs- und Zeitschriftenverlagsgesellschaft, Hamburg, Die Zeit, no. 44, 31 October 1969, pp. 63, 65-67.

(2) Roellecke, Gerd, Wissenschaftsfreiheit als institutionelle Garantie? (Independence of science — an institutional guarantee?), Verlag J.C.B. Mohr (Paul Siebeck), Tübingen, Juristenzeitung, no. 22, 21 November 1969, pp. 726-733.

(3) Echterhoff-Severitt, H., Wissenschaftsaufwendungen in der Bundesrepublik Deutschland. Folge 5: Aufwendungen der Unternehmen für Forschung und Entwicklung im Jahre 1967. (Expenditure on science in the Federal Republic of Germany. Series 5: Expenditure by industry on research and development in 1967), Stifterverband für die Deutsche Wissenschaft, Essen-Bredeney, Wirtschaft und Wissenschaft, no. 5, September/October 1969, pp. 19-22.

(4) Leussink, Hans, Quantitative Überlegungen zum tertiären Bildungsbereich (Quantitative reflections on higher education), Verlag Moritz Diesterweg, Frankfurt/Main, Politik, Wissenschaft, Erziehung, 1969, pp. 83-97. Commemorative edition for Ernst Schütte.

(5) Küchenhoff, Erich, and Lüthje, Jürgen, Sicherung und Ausbau der Wissenschaftsfreiheit im neuen Hochschulrecht (The maintenance and extension of the freedom of science in the

new legislation on higher education), J.C.B. Mohr (Paul Siebeck), Tübingen, Wissenschaftsrecht, Wissenschaftsverwaltung, Wissenschaftsförderung, v. 2, no. 3, October 1969, pp. 226-240.

(6) Politik, Wissenschaft, Erziehung. Festschrift für Ernst Schütte (Politics, science and education. A commemorative publication for Ernst Schütte), Verlag Moritz Diesterweg, Frankfurt/Main, 1969, 218 pp.

(7) Zur Bildungsreform in der Bundesrepublik Deutschland. Impulse und Tendenzen (Educational Reform in the Federal Republic of Germany. Initiatives and tendencies), Verlag Julius Beltz, Weinheim, 1969, 299 pp.

(8) Westdeutsche Rektorenkonferenz, Dokumente zur Hochschulreform XI/1969. Hochschul- und Wissenschaftspolitik in Programmen und Leitsätzen der Parteien (West German Rectors' Conference: Documents on the reform of higher education. University and science policy as formulated on party platforms and axioms), Bonn-Bad Godesberg, 82 pp.

(9) Schelsky, Helmut, Abschied von der Hochschulpolitik oder die Universität im Fadenkreuz des Versagens (A farewell to higher education policy or: Universities on the way to failure), Bertelsmann-Universitätsverlag, Gütersloh, 1969, 251 pp.

(10) Häfele, Wolf, and Seetzen, Jürgen, Prioritaten der Großforschung (Priorities in big science), 'Tempus' Zeitungsund Zeitschriftenverlagsgesellschaft, Hamburg, Die Zeit, no. 44, 31 October 1969, pp. 68-72.

(11) Weltraumprogramm. Mittelfristiges Programm der Bundesregierung zur Förderung der Weltraumforschung und Weltraumtechnik in der Bundesrepublik Deutschland 1969-1973 (Space programme. Medium-term programme drawn up by the Federal Government for the promotion of space research and technology in the Federal Republic of Germany from 1969 to 1973), Bundesminister für wissenschaftliche Forschung, Bonn, 1969, 76 pp.

(12) Schreiterer, Manfred, Außen-Wissenschaftspolitik – Maßstab der Zukunft (International science policy – yardstick for the future), Verlag Rombach, Freiburg, Außenpolitik, no. 7, July 1969, pp. 412-423.

(The above list of publications was obtained from *Science Policy News*, v. 1, no. 6, May 1970.)

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
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Environment
Foreign Affairs
Fortune
Futures
Harvard Business Review
Impact of Science on Society
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International Science Notes
Minerva
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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
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