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This bimonthly bulletin reports the current literature in science and public policy. Science is used to denote engineering, technology, and other sciences. The bulletin is intended for persons engaged in studying, formulating, or implementing public policy relating to science and its use. Its purpose is to aid such individuals by alerting them to new additions to the science policy literature. The information presented consists principally of an annotated bibliographic listing of current publications in the area. Publications of a highly technical and narrowly specialized nature are excluded. The bibliographic information is presented under eight topical categories: (1) general, (2) science, domestic problems and national goals, (3) needs and allocation of resource for science, (4) national R and D programs, (5) science, education, and the university, (6) science management and policy making bodies, (7) science, foreign affairs and national defense, and (8) science policy in foreign countries. Each cited publication is recorded only under a single category. The numbering of publications under each category runs consecutively through all issues of the bulletin so that a given number refers to only one citation. Major meetings and other events in the subject area are also reported. (RS)

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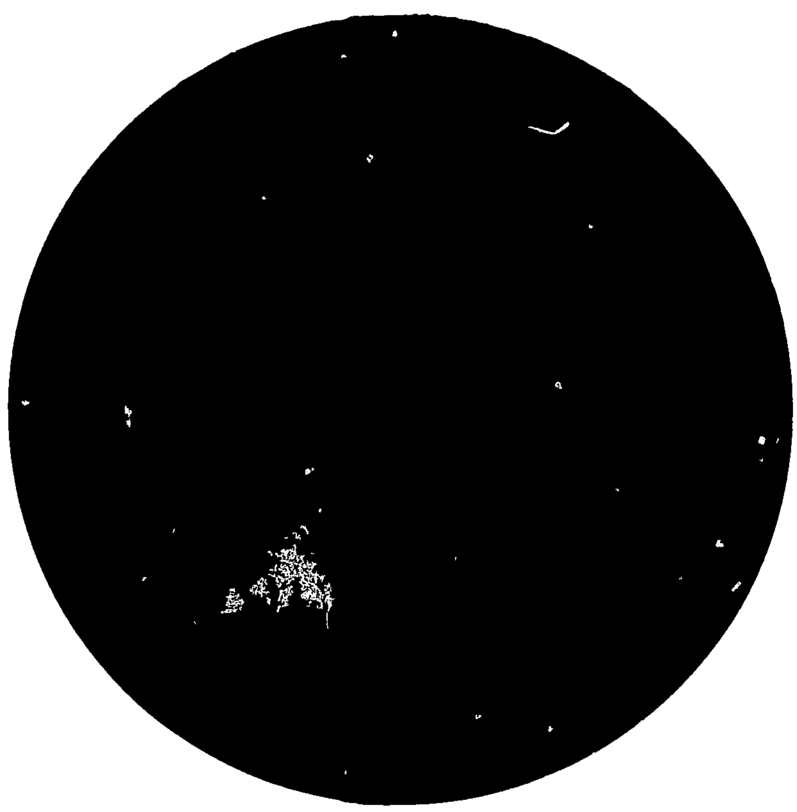

Science Policy Bulletin

Battelle Memorial Institute

SCIENCE POLICY BULLETIN

The Bulletin, published bimonthly, reports the current literature in the area of science and public policy. The coverage encompasses 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 engaged in studying, formulating, or implementing public policy relating to science and its use. The purpose of the Bulletin is to aid such individuals by alerting them to new additions to the science policy literature.

The information presented in the Bulletin consists principally of a bibliographic listing of current publications in the area. In addition, major meetings and other events in the subject area are reported.

The bibliography, although covering a broad topical scope, is selective in that publications of a highly technical and narrowly specialized nature are excluded.

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Copies of the listed publications are not available through Battelle but can normally be obtained from the originating agency.

The contribution of information to the Bulletin as well as suggestions and comments on its content, coverage, and format are solicited. All correspondence should be addressed to:

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I GENERAL

1. Hornig, D.F., "United States Science Policy: Its Health and Future Direction", Science, v. 163, no. 3867, 7 February 1969, pp. 523-528.

The author discusses in detail the main problem areas identified by the OECD's (Organization for Economic Cooperation and Development) examination of U.S. science policy and presents two proposals. The main problem areas include: "academic science and the universities, the role of the government in industrial research, some of the social impacts of U.S. science policy, and the adequacy of the mechanisms in the U.S. government for dealing with these problem areas". "With regard to academic science and the universities, the central questions are: ... how to provide training of high quality for enough scientists and engineers of the right kinds ... how to maintain vigor and creativity in the basic research establishment ... how to set priorities and determine the relative emphasis given to different research areas". Although "the current problems of academic science 'appear' to have their origins in the budget stringencies", Hornig believes the fundamental problem is "the failure of the university and the scientific community to effectively communicate its values, it purposes, and its contributions to the public and to the lawmakers". With regard to the role of government in industry, a "great deal more work needs to be done to sharpen the tool of standard setting as a means of introducing product improvement and change in particular sectors of industry. Standards must be based on sound scientific evidence, which must be continuously reexamined and improved". For example, the leadership for pollution abatement, "lies in the government through its role in standard setting and in supporting science and technology to demonstrate what can be done, and how. It will be the essential job of industry to find cheaper and improved ways of applying the new technology". "With the exception of selected industries somehow identified with the public interest (for example, agriculture, atomic energy, the supersonic transport, water desalting, pollution abatement, and a few others), the government has not subsidized civilian-oriented industrial research. Further measures to stimulate technological innovation may be needed, but there appears no need for an across-the-board, direc approach by the federal government". Two of the specific proposals which Hornig made include: 1) the Office of the Science Advisor needs to be strengthened by the addition of a three to five man Council of Scientific and Technical Advisors of full-time top level people, 2) reexamine the possibility that "those scientific activities not tied to the central purposes of an agency be considered for inclusion in a department of science, with the National Science Foundation as a core".

2. "DuBridge: 10-12% Growth for Science", Scientific Research, v. 3, no. 26, 23 December 1968, pp. 11-12.

    Several ideas and tasks of Lee DuBridge, President Nixon's science advisor, for reorganizing federal science are discussed. DuBridge believes that federal research budgets should be increased 10 to 12 percent annually. This percent annual increase in spending is only a few percentage points below the increase recommended by the New York Academy of Sciences. "One of DuBridge's first tasks is to decide whether or not to recommend detaching the science advisory job from any or all of the three additional posts his predecessor, Donald F. Hornig, held simultaneously. They are: director of the Office of Science & Technology (OST), chairman of the Federal Council on Science & Technology (FCST), and chairman of the President's Science Advisory Committee (PSAC)". DuBridge feels it would be desirable to have at least one other person assume some of these tasks. He also plans to review the chairmanship of the FCST and the PSAC. "A major problem facing DuBridge is the National Science Foundation's financial doldrums. He is determined to help the Foundation, and may transfer more responsibility for national coordination and planning of basic research from the OST back to the Foundation -- where it originally resided before OST took over this responsibility a few years ago". Concerning higher education and research, DuBridge is not "convinced that the federal government is so short of money that it can no longer afford the $1.5 billion it has been investing [annually] in university education and research". The remainder of the article presents various opinions on the need to reorganize the science advisory structure.

3. "Policy Issues in Science and Technology: Review and Forecast", Third Progress Report, Subcommittee on Science, Research, and Development, to the Committee on Science and Astronautics, U.S. House of Representatives, Ninetieth Congress, Second Session, 1968, 54 pp.

    The past activities of the Subcommittee are reviewed and its plans for the future are described. Past activities include hearings and reports on such topics as basic research and national goals; government, science, and public policy; applied research and technological progress, allocation of federal science resources; utilization of federal laboratories; science education; environmental quality; international science; technology assessment. Beyond this, "the subcommittee has isolated certain areas which appear to require comprehensive attention in the near future". These include technology assessment, environmental quality, the International Biological Program, the utilization of federal laboratories, institutional grants for science, application of science to urban problems, and agency oversight. Each of these areas is briefly discussed in terms of the needs for further attention and the specific plans of the Subcommittee for dealing with it. For example, a triology of studies commissioned by the Subcommittee will be used to draft "legislation to replace the original bill for a Technology Assessment Board", and as part of its oversight function, the Subcommittee has tentatively identified the following areas of special concern in the forthcoming budget authorization hearings for the National Science Foundation (NSF): applied research, NSF's role in education, international science programs, science curriculum programs, ecological programs, and sea-grant programs.

(This report can be obtained for the U.S. Government Printing Office, Washington, D.C.).

4. Salomon, J., "Some Examples of National Science Policy", Science Policy Information, no. 5, Organization for Economic Cooperation and Development (OECD), November 1968, pp. 97-110.

Similarities and differences in the structural and functional aspects of the science policies of various countries are described, and some trends in science policy formulation and application are discussed. The author, who is Head of the Science Policy Division of the OECD Scientific Affairs Directorate, starts with brief descriptions of the institutional structures for science policy in the U.S., France, Belgium, United Kingdom and Germany. He notes that pluralism and decentralization ("organized incoherence") is the chief structural feature of the U.S., in contrast with the centralized approach of the French; the other countries fall somewhere between these two extremes. Salomon concludes that the "flexible, pluralist anglo-saxon system" provides "'ad hoc' answers to problems as they arise", while the more centralized approach provides "'a priori' solutions to the problems with which it is confronted"; the question of creating a single department of science and technology constantly crops up; and at least two types of institutions are needed -- a permanent secretariat and research service plus an advisory body of experts representing "various interests and authorities". In respect to the functional aspects of science policy, Salomon sees a converging similarity among nations:

the need for evolving policies "has arisen as a response to some definite challenge"; the way in which priorities are decided are similar even if the challenges differ; and political considerations and "rationality" increasingly pervade science policy.

5. "91st Congress -- Many Problems in Science Area", Chemical & Engineering News, v. 47, no. 1, 6 January 1969, pp. 28-29.

Some of the science-related issues and problems faced by the 91st Congress are discussed. Perhaps the most pressing problem for basic research at universities is the size of the federal contribution, however, "there are several other problems in the federal-university relationship that are nearly as pressing". These include: 1) better geographical distribution of R&D funds -- permitting the "have-not schools to get their fair share of research money which, up till now, has been going to 'the favored few'"; 2) Block grants vs. project grants for university research -- Block grants would give universities more to say about the detailed direction research takes in their various departments; 3) limit on allowable indirect costs in research grants; 4) forecasting pollution potential of new technology -- implicit in this is some sort of Congressional power to veto those developments deemed harmful; 5) how to assess the impact on society of new technological development; 6) reform of patent laws; 7) reform of copyright laws; 8) an official compendium of prescription drugs, including price ranges, and a limit on the cost of drugs furnished under federal health programs.

6. Wiesner, J.B., "Rethinking Our Scientific Objectives", Technology Review, v. 71, no. 3, January 1969, pp. 15-17.

"[G]iven the present antagonisms and ... skepticism about the value of a continued high level of [R&D] support, the only solution is to reorganize and strengthen the federal mechanisms for planning and supporting [R&D]". Much of the present disarray of the scientific establishment arises "because we do not have a sound strategy for science". For the past 20 years, most of R&D support has been based on "Cold War incentives", which have produced a "seriously lopsided research program". The National Science Foundation (NSF), which should have corrected the situation, has never been adequately supported; efforts to deal with environmental and urban problems have not been "well conceived or well managed". There is today no effective process by which our nation can really focus on its problems and needs ... no single entity of government with responsibility for planning and monitoring the broad range of [R&D] activities required to support the national goals". To fill this gap, Wiesner proposes a new agency with the NSF as its core. In addition to NSF's present responsibilities, the agency would "indicate resource allocation for all public endeavors, including foreign aid and national security"; support "basic and exploratory research in the environmental and urban areas, in education", and other undersupported areas; "stress the ... social and human sciences and the technology needed to do forecasting and resource allocation studies"; and possibly, develop "an analysis and forecasting system to support the executive and legislative branches of the government".

7. Shannon, J.A., "Science and Social Purpose", Science, v. 163, no. 3869, 21 February 1969, pp. 769-773.

   The author proposes fundamental changes in the national science effort and discusses these proposals in respect to biomedical research. Necessary changes now confronting the scientific community include: 1) "... adjust ... to less than optimum funding, at least for the present, while retaining the essential strength of the scientific enterprise. 2) ... seek out the imperfections of the present support systems, and propose modifications that are corrective and, in addition, rationally based and generally applicable to the diverse fields of science. 3) ... devise means of fostering a broader understanding of the revolutionary technological forces that can be unleashed by a vigorous science for the betterment of society". In respect to biomedical research: "The conquest of serious disease and attainment of the essentials for a better quality of life are not visionary goals. They will, however, require a substantial expansion of research under circumstances that provide comparably well-developed support for educational and service programs. A prime essential for such accomplishments is the development of central analysis and planning functions that are adequate to the task of ordering national priorities and serve as a basis for the allocation of resources among broad fields of science and within the biomedical field". It was also suggested that "an adequate public information program that portrays not only achievement but also prospects and problems" be developed.

8. Wheeler, H., "Bringing Science Under Law", The Center Magazine, v. 2, no. 2, March 1969, pp. 59-67.

   The scientific and technological revolution is discussed in detail with particular attention to the history and philosophy of the scientific intellectual ethic. The author comments: "The question ... arises as to whether or not we can or should act collectively to inhibit the harmful effects that may result from the bad uses of science and technology", and further "that neither the people, their elected representatives, nor even bureaucratic experts are competent any longer to 'legislate' about scientific problems. The traditional deliberative processes of Western democracy ... were undermined when it became apparent that they could not cope with the implications of contemporary science for public policy". The author proposes that a "public corporation for developmental science ... be chartered and given its constitution. Civilian control can be installed and charged with the responsibility for several functions that are not now being performed at all. Most obvious is the need for an ombudsman to process public complaints ..., he should also see that the scientific enterprise achieves its publicly approved goals. This would require a special court system of adjudication ..." The "constitutionalization of science" is discussed in detail, as well as the necessity of uncovering "the extended social implications of the scientific matters at issue". International or transnational constitutionalizing of science is also considered.

9. "Technology in Retrospect and Critical Events in Science", Vol. 1, Prepared by The Illinois Institute of Technology Research Institute, Under Contract NSF-C535, for The National Science Foundation, 15 December 1968, 104 pp.

The relationships of research, development, and technological innovation are investigated for five major innovations: magnetic ferrites, video tape recorder, oral contraceptive pill, electron microscope, and matrix isolation. For each innovation, the sequence of key research and technical events were traced from the pertinent basic research to the appearance of the innovation. The types of institutions (university, research institute, industry, and government) in which the "events" occurred were tabulated and the time factors in the transition from nonmission research to innovation were determined. Nonmission (or basic) research was found to figure prominently in each innovation -- greatest in the electron microscope and least in the video tape recorder. "These two innovations represent extremes, in that a more balanced interplay between nonmission research, mission-oriented research, and development and application characterizes most tracings". Other conclusions include: 1) of all key events, 70 percent were nonmission research, 20 percent mission research, and 10 percent development and application; 2) "The number of nonmission events peaks ... between the 20th and 30th year prior to an innovation", while those in the other two categories "peak during the decade preceding innovation"; 3) The "average time from the conception to demonstration of an innovation was nine years".

(This report can be obtained from the National Science Foundation, Washington, D.C. 20550. Volume 2, which will be issued in the near future, supplies more detailed technical information regarding the events and their tracings).

10. Lindvall, F.C., "Science and the Social Imperatives", American Scientist, v. 56, no. 4, Winter 1968, pp. 303-311.

A re-evaluation of national goals is presented with suggestions for future policies. Some historical background, past fiscal policies, and objectives are discussed. The author discusses complaints that U.S. leadership in some scientific areas is being lost to Western Europe and Russia and comments that "national interest may be served better by putting our fiscal house in order and reallocating resources to social needs". With increased emphasis on utility and application, the author suggests areas of immediate concern to science and technology: water pollution, waste disposal, thermal pollution by waste heat, atmospheric pollution. The possibility that future choice of research may not be entirely free is also discussed, especially with regard to reduction of Federal support to colleges and universities. Changes will be in the type of support and relevancy to social needs. Such changes could bring applied research into a more "appropriate balance with basic research".

11. Nelson, B., "Science Policy Meeting at M.I.T.", Science, v. 163, no. 3869, 21 February 1969, p. 797.

A private meeting about the character of science organization in the federal government was recently held at M.I.T. All former Presidential science advisers -- Donald F. Hornig, Jerome B. Wiesner, George Kistiakowsky, and James R. Killian were present. A number of congressmen also attended. Although the meeting was not designed to produce a formal record, "it can be concluded that the following themes were among those in the discussion": 1) "Although there have been several noteworthy proposals, recently, to create an all-encompassing Federal Department of Science and Technology at the Cabinet level, this idea seems not to have found favor at the meeting". 2) "... several of the participants ... concluded that the President's science adviser occupies a central and increasingly important role and should not become the spokesman for any one government agency". 3) "Even though a department of science and technology is not especially needed, the federal government should do more to support science and the universities and should find ways to encourage more people to enter scientific careers". It was noted that federal science organization may be the subject of hearings held by the House committee this year.

12. "Harvard University: Program on Technology and Society", Fourth Annual Report, 1967-1968, 96 pp.

This is the fourth annual report for Harvard's Program on Technology and Society. The program was "established in 1964 by a grant from the International Business Machines Corporation to undertake an inquire in depth into the effects of technological change on the economy, on public policies, and on the character of the society, as well as into the reciprocal effects of social progress on the nature, dimension, and directions of scientific and technological developments". The first part of the report describes the Program's activities of 1967-68. Sixteen research projects are grouped according to three general themes: Technology and Social Change, Technology and Values, and Technology and Political Organization. Brief descriptions of other activities and of the evolution of the Program's Study Group are also included. The second part is a three-part essay by the Director in which he attempts "a first statement of what we are beginning to find out about the implications of technological change for society, based in large part on the research of the Program during its first four years". Four appendices contain details about the Program's information activities and organization.

(The report can be obtained from: Emmanuel G. Mesthene, Harvard University Program on Technology and Society, 61 Kirkland St., Cambridge, Mass. 02138).

13. "Program of Policy Studies in Science and Technology Report", 1967-1968, The George Washington University, Washington, D.C., 90 pp.

This is the second report of the Program of Policy Studies in Science and Technology; it presents the continuing study of the structure and functions of institutions that "stimulate, utilize, regulate, and appraise the application of science and technology" to fulfill public or community goals. Research studies and papers relevant to the program include the following areas of inquiry: 1) "The New Technological Era: A View from the Law", 2) "Toward the Techno-Corporate State", and 3) "A Cross Polity Research Approach to the Study of Developing Countries and the Establishment of a Data Bank on Selected Countries". The basic and continuing activities of the program are summarized as follows: "'[T]he program is designed to increase the University's policy research capability and to stimulate thought and new activities on questions involving the Science/Society interface. In our view, one of the principal functions the Program can perform is that of providing a forum for the discussion of such matters. From a broader perspective, the Program of

Policy Studies is a mechanism for exploring alternative ways of organizing intellectual skills so as to apply effectively such resources to the urgent needs of contemporary society'".

(The report can be obtained from the Program of Policy Studies in Science and Technology, The George Washington University, Washington, D.C. 20006).

II SCIENCE, DOMESTIC PROBLEMS, AND NATIONAL GOALS

1. "Slim Hope for Research, Ghettos", Science News, v. 95, no. 3, 18 January 1969, pp. 62-63.

    Mr. Nixon's ability to deliver industrial participation in such areas as elimination of water pollution and such social engineering projects as low-cost housing and job training "will depend in large part on his ability to induce ... a reluctant Congress to consider tax incentives to industry". "The problem is that these programs, while costly in both money and sophisticated manpower, cannot be considered profit-making enterprises of the kind in which industry ordinarily invests. Incentives will have to be provided, probably in the form of tax incentives -- rapid depreciation write-offs of capital investments or the even more controversial tax credits: the deduction of a part of a cost from a final tax bill". Representative Wilbur D. Mills (D-Ark.), chairman of the tax-writing House Ways and Means Committee, "objects in principle to the manipulation of the tax sturcture for nonrevenue-related funds. He also would insist that tax credits, or other tax incentives, show up in the budget as Federal expenditure so as not to become a back door approach to Federal spending". Besides the proposal for the training of workers, "Rep. Mills' committee expects to have before it this year proposals for tax credit treatment of such diverse expenditures as the rehabilitation of gold mining property, housing in urban poverty areas, state tax payments and expenditures on higher education. The Congressional future for all of them is bleak". Nevertheless, Federal incentives for water pollution control efforts by industry have already been endorsed, however an incentive plan to draw industry into the ghetto is less likely.

2. Jaramillo, E.J., Jr., et al, "Public Sector Problems Suitable for Systems Engineering Research", Stanford University, Stanford, California, 1968, 156 pp.

    This report is the result of a study performed with the cooperation of federal agencies to seek problems in the public sector to which systems engineering research might be applied. "The objectives of the study were to find out what Federal government officials consider to be the most critical domestic problem areas, to ascertain current research programs and their progress in these problem areas, to single out problems whose solution might be attempted by systems engineering techniques..." The broad problem areas identified are transportation, communication, environment, community, and agriculture. For each area, the report discusses a series of problems and considers some approaches toward their solution; a bibliography is presented for each problem. For example, in the transportation area the report designates twelve major problems, including "Rapid Transit Systems", "Emergency Highway Rescue Systems", "City Streets Traffic Control Systems", and "Integrated Dock-Land Terminal Design". "This report contends that interdisciplinary teams of graduate students of science, engineering, business, law, and the social sciences can apply systems engineering principles to make ... significant contributions toward the solution of some of our national problems".

(The report can be obtained for $3.00 from the Government Clearinghouse, Springfield, Va. 22151).

3. Boffey, P.M., "Nixon Panel Reports on Environment", Science, v. 163, no. 3867, 7 February 1969, p. 549.

A recent report prepared by a Nixon task force on Resources and the Environment urges that "improved environmental management be made a principal objective of the new Administration". The report particularly stresses the need to improve "the declining environmental quality of our urban areas", it also urges that "existing programs be made to work better through greatly increased appropriations, better coordination, new regional approaches, and a strengthened role for industry and for state and local governments". Some of the recommendations from the report include: 1) Appoint a Special Assistant for Environmental Affairs, "who would serve as a 'focal point' for the government's scattered environmental concerns and who 'would evidence dramatically the new Administration's concern for a better environment'". 2) Each federal agency "whose activities 'significantly affect the environment' should establish a 'focal point of environmental responsibility'. 3) The present inter-agency Council on Recreation and Natural Beauty should be broadened into a Council on the Environment, with the Vice President continuing as chairman. "There is no certainty that any of the recommendations will be acted on", but this report may "carry particular weight, for it was prepared by a group headed by Russell E. Train, president of the Conservation Foundation, who last week was named Under Secretary of the Interior".

4. "Progress in the Prevention and Control of Air Pollution", First Report of the Secretary of Health, Education, and Welfare to the United States Congress, (28 June 1968), Senate, Ninetieth Congress, Second Session, 1968, 85 pp.

"This is the first of a series of reports which will describe the progress being made in this country to prevent and control air pollution". "The purpose of this first progress report is to describe recent activities initiated under the Air Quality Act of 1967, which was signed into law on November 21, and to place in historical perspective the air pollution problem as a whole, summarizing the continuing efforts being made to cope with it". Chapters include pertinent definitions of atmospheric areas, pollution levels and types, and development and status of air quality criteria documents. Progress in effective pollution control with respect to control and surveillance technology and Federal abatement activities is presented. Additional research in air pollution and meteorology, economic and health effects of pollution is discussed, and the composition and function of advisory committees provided by the Air Quality Act are outlined.

(This report can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price 30 cents).

5. Pickering, W.H., "Science and the Urban Crisis", International Electronic and Aerospace Report, v. 3, no. 1, February/March 1969, pp. 11-13.

"Since our urban crisis constitutes a challenge of overwhelming national urgency, science and technology must address themselves to this critical area with the classic four-fold alignment of systems analysis: sensing devices for gathering pertinent data, computer-oriented systems for processing and analyzing data, decision-makers to act on processed data, and control devices to complete the look through a regulatory feedback system". The author (Director, Jet Propulsion Laboratory, California Institute of Technology) discusses the need for applying science and technology to social problems, briefly reviews some efforts in this direction, cites several examples of what we have "bought for the $50 billion spent in space in ten years", and describes some of the consequences of cutbacks in "space and basic R&D activities". He concludes that "lack of public support is endangering development of future scientists and output of basic knowledge, which can have a serious effect on our scientific and technological leadership". More broadly, Pickering calls for a federal-level body to plan and initiate policy and legislate programs in which industry and science would "collaborate in applying systems management for implementing large-scale urban rehabilitation".

6. "Crime Research Grants", Science, v. 163, no. 3864, 17 January 1969, p. 262.

"The Justice Department has announced 'Exercise Acorn', a small grants program to encourage new ideas in research and development in broad areas of crime prevention, crime control, and the administration of justice. The recently established National Institute of Law Enforcement and Criminal Justice within the Justice Department plans to award about

50 grants, not exceeding $5000 each, to scientists, scholars, and other professionals interested in research in such areas as the reduction of crime, the improvement of law enforcement services, courts, and correctional institutions, including parole and probation agencies. There are no specific eligibility requirements for grant applicants. Institutional and individual project proposals may be submitted to Ralph G.H. Siu, Director, National Institute of Law Enforcement and Criminal Justice, Department of Justice, Washington, D.C. 20530".

7. "Aerospace in Perspective -- The New Directions", Space/Aeronautics, v. 51, no. 1, January 1969, pp. 106-107.

   A systems approach to civil problems is discussed in terms of potential growth areas for the aerospace industry and problem areas. The special discussion was prompted by pressures to apply "human and technological resources to domestic problems". Of greatest significance is the recognition that domestic problems need a "systems approach" even if results to date "have been disappointing". Growth areas for aerospace industry spinoff include urban, environmental, surface-transportation, medical, and ocean systems. Initial attempts to deal with some of these systems have resulted in the following "lessons that will have to be learned": 1) "Massive problems require efforts on a massive scale; neither token nor piecemeal attacks will do", 2) "The R&D cycle for a complex civil system is always longer than the political cycle that is being counted on to support it"; thus support maybe limited to current terms of office, which tends to cripple development of a civil system, and 3) "even when a system does get built, jurisdictional prerogatives can make a mess of the implementation". The article recommends that aerospace companies employ their capabilities "to assess their experience in high technology and their managerial skills" to enable themselves to apply "their experience to new systems challenges". Implementation of technology is also seen as the industries' responsibility since "a lay consumer public and its elected or appointed representatives cannot be expected to do so".

8. Science, Technology, & State Government, Proceedings of the NSF-SINB Conference, (19-20 September 1968), Louisville, Ky., 1969, 238 pp.

   This conference, sponsored by the National Science Foundation and the Southerm Interstate Nuclear Board, focused on the problems, issues, and opportunities now confronting state and local government in the processes of technological development. Presentations by a number of prominent governmental leaders, educators, and industrialists ranged from topics on state and local policy considerations to specific programs for scientific exploitation. It was concluded that at "the present time only a few states have an organizational mechanism for integrating science and technology into the processes of state and local governments, and the few states that have such mechanisms are not supporting activities necessary for a long-term accomplishment. A relevant federal program and an effective organizational mechanism in every state is essential to national progress". It was proposed that "a federal-state partnership be established through an appropriate federal agency to develop policy, provide counsel, and support: a) Block grants on the order of $100,000 per year for each state to science and technology agencies on a fifty-fifty watching funds basis; b) Project grants, which ultimately might total as much as a million dollars a year, per state, through the state science and technology agencies with guidelines to be established by the federal-state partnership".

(The report can be obtained from Mr. M. Frank Hersman, Office of Planning & Policy Studies, National Science Foundation, Washington, D.C. 20550).

III NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE

1. Fisher, W.H. and Lederman, L.L., "Probable Levels of R&D Expenditures in 1969 -- Forecast and Analysis", Report from Columbus Laboratories, Battelle Memorial Institute, December 1968, 6 pp.

   Trends in R&D expenditures and prospects for the future are presented and analyzed. This report, the latest in Battelle's series of annual forecasts of R&D, presents an estimate of R&D activity for calender year 1969 by source of funds and by performer, discusses factors affecting federal support, and describes the roles of industry, academic and other nonprofit institutions in R&D. For 1969, Battelle forecasts total R&D expenditures of $25.9 billion, up 3.6 percent over 1968, with $15.9 billion from the government, about $9 billion from industry, and over $1.2 billion from nonprofit sources. Government expenditures for R&D are expected to grow at an annual rate of from 4 to 8 percent over the next decade, as compared with 9 percent during the 1959-1968 period; however, the annual dollar increase during the next decade will be significantly larger than during the previous decade. Among the factors discussed as affecting federal R&D support are the present fiscal pressures, the "controllable" nature of the R&D budget, the Vietnam war (peace would have little immediate effect on R&D spending), the growing pressure for social action programs, and the "increasing talk of the need for more formalized systems ... for establishing research priorities and achieving more rational allocations of supporting funds". Industry, which increasingly depends upon "planned R&D ... as a main source of corporate growth", is expected to increase its R&D activities at a faster rate than government. The nonprofit institutions in 1969 are expected to provide 4.8 percent of all funding and to perform 17 percent of the total R&D.

   (This report can be obtained by writing: Battelle Memorial Institute, Columbus Laboratories, 505 King Ave., Columbus, Ohio 43201).

2. "The Fiscal -- '70 Budget in Perspective", Scientific Research, v. 4, no. 3, pp. 12-13,15.

   Johnson's proposed budget for fiscal '70 is presented for five agencies; National Science Foundation (NSF), National Institutes of Health (NIH), NASA, Department of Transportation (DOT) and Housing and Urban Development (HUD). Whether or not DuBridge, President Nixon's science advisor, will be able to increase the research budget will depend on many variables, including: "the priorities actually assigned to r&d by the Nixon Administration; the direction of peace talks on Vietnam; the mood of Congress' and DuBridge's salesmanship". NSF's '70 budget request is only $500 million (the fourth straight year at this level), and later this year NSF "faces the specter of a deep congressional cut for the second successive year". NIH, with a budget of $1.54 million will be able to finance only a few more project grants next year than this (10,749 in '70 as against 10,737 this year and 11,405 last year). DOD is the only major agency research budget increasing at a higher rate than the cost of living; the budget for military research is up 7.5 percent -- from about $900 million to $970 million. "At $3.8 billion, NASA's budget is down (again) but such science-oriented programs as lunar and planetary exploration and the Apollo Applications Program are up -- exploration from $81.8 million this year to $146.8 million next year; Apollo Applications, which includes two laboratories for earth orbit, up from $150 million to $308.8 million". DOT has an R&D budget of $234 million (up 50 percent from its $156 million this year), with $82 million for research. HUD's R&D budget of $31 million (up 72 percent from this year's 18 million) includes $11 million for research and $20 million for development.

3. Danitor, V.J., "$26-Billion for Research", Industrial Research, v. 11, no. 1, January 1969, pp. 62-66.

Current rates of Federal R&D funding and shifts of emphasis within the budget structure are discussed. In spite of the slowdown in the rate of increase of R&D funding, the total amount of funding is expected to reach $26 billion by the end of 1969, compared with less than $12.5 billion 10 years ago. The number of scientists, engineers, and technicians involved in R&D will be about 700,000. The per capita expenditure for these personnel is climbing at the rate of about $2000 per year according to National Science Foundation data. The current expenditure is estimated to be $49,000 per research. Major changes in emphasis in the budget are expected: "For example, there already has been a shift away from basic research and the civilian space program toward new weapons systems and research on social and urban problems". Also, President Nixon will be faced with a new budget p ossibility, the "establishment of a new Agency for nonmilitary oceanographic research and development". Industry is expected to perform $18 billion in R&D, half of which will be their own funds. This private funding is seen as necessary for the development of new ideas and products. The author charges that many government officials "are more interested in cutting government costs than they are in making new discoveries or solving far-reaching problems and observes that solutions to urgent problems must be "done swiftly and effectively" or "the United States could lose its scientific and technological leadership".

4. "Federal Support to Universities and Colleges, Fiscal Year 1967", National Science Foundation, NSF 69-7, Washington, D.C., 1968, 86 pp.

This report is the third in a series prepared for the Federal Council for Science and Technology's Committee on Academic Science and Engineering (CASE). "Data contained in the report cover Federal Fiscal Years 1963-67 ... Eight Federal agencies supplied the data contained in this report on Federal obligations for research and development, R&D plant or facilities, other science activities, and nonscience activities at U.S. universities and colleges and the Federally Funded Research and Development Centers (FFRDC's) managed by academic institutions". Data collected for this report are organized in tabular form and include the following information: While Federal support increased from 1963 to 1967, the yearly growth rate slowed from 42 percent to 32 percent; nonscience funds between 1964 and 1967 rose from 6 to 30 percent of the total obligations; the geographic distribution of support from 1966 to 1967 showed little change; Federal support "was more widely dispersed in 1967 than in 1966 and 1963"; "the Department of Health, Education and Welfare continued to account for two-thirds of total Federal support to universities and colleges".

(This report can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.00).

5. "Employment of Scientists and Engineers in the United States, 1950-66", National Science Foundation, NSF 68-30, Washington, D.C., 1968, 55 pp.

"This report presents the findings of an employment study undertaken by the Bureau of Labor Statistics in cooperation with, and with support of, the National Science Foundation. It encompasses ... a comprehensive historical employment series for scientists and engineers covering a 16-year period, 1950-66, and includes all sectors of the economy by each major scientific occupational group". Some of the highlights of the study include the following: (1) Employment of scientists and engineers in the U.S. rose from 550,800 in 1950 to 1,412,500 in 1966, or by 156 percent; in comparison, total employment increased by only 24 percent over the 16-year period. (2) Scientific occupations increased more rapidly than engineering, growing by 185 percent from 146,300 to 416,800, whereas engineering increased by 146 percent from 404,600 to 996,000. (3) Between 1950 and 1966, the number of scientists and engineers engaged in R&D rose by 242 percent. The proportion of R&D personnel grew steadily from 28 percent of all scientists and engineers in 1950 to 37 percent in 1966. (4) Private industry was the largest employer of scientists and engineers, with 71 percent of the total in 1966. Governments -- Federal, State, and local -- employed almost 16 percent; universities and colleges, nearly 13 percent; and nonprofit institutions, about 1 percent.

(This report can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price 70 cents).

6. "Science Lets Out a Yell for Money", Business Week, no. 2056, 25 January 1969, pp. 86-87.

This article discusses the federal budget cuts and its effects on science. "The new federal budget calls for curtailing many corporate and university research and development projects". Within the budget totals, "there is a clear shift in the purpose and priorities of government-sponsored R&D. Allocations for much basic scientific work are cut back severely. But rises are asked for research on crime reduction, postal operations, transportation -- not strictly scientific research at all. Then, the budget totals themselves are deceptive ... the totals seem to show a modest rise. But R&D commitments projected at $16.7 billion for next year will actually be less than 9% of the entire federal budget ... the lowest percentage ... since 1960". "The 'holding' pattern is clear in individual budgets". These include: the Department of Defense, the Atomic Energy Commission, and the National Institutes of Health. "By contrast relatively big gains in R&D funding are recommended for several agencies involved in national problems, and not considered major clients for R&D. They include: 1) The Justice Dept., which will get $300-million for research and training on the reduction of crime. 2) The Transportation Dept., which embarks on a project for developing new urban transit vehicles and a system of ocean buoys for air and water measurement. 3) The Post Office, which will try to shove its $36-million R&D program up more than 40% to increase its R&D capabilities and to try out new electronic and mechanical equipment to move mail faster".

7. "NASA Tightens Its Belt Another Notch", Electronics, v. 42, no. 1, 6 January 1969, pp. 141-142.

Speculations about NASA's 1969 budget are presented; the prevailing opinion is that this will be another relatively slow year for space spending. "Less than 35% of the agency's fiscal 1969 budget of $3.85 billion will be spent through June 30; most of the money went last year, and what's left will go largely for studies and services. At the moment, NASA plans on submitting a fiscal 1970 budget of $3.875 billion. Officials hope to boost this amount once Nixon takes office". Nevertheless, development projects abound now. Among the projects mentioned are the following: earth resources technology satellite; Mars probes (1973); synchronous orbit meteorological spacecraft; early design work for Mercury missions (1973); swing-by missions of the outer planets -- Jupiter, Saturn, Uranus, and Neptune (1976-1979); development of vertical/short-takeoff-and-landing-systems (V/STOL) elements, such as inertial navigation and on-board tracking; and space communication systems (data communication and tracking). However, the major concern appears to be keeping the existing programs going. Space hardward outlays are expected to be below the 1968 level. Project offices are directing their effort to obtain "seed money" for long-lead-time programs mentioned above.

8. "Earthquake Research Proposal", Science, v. 163, no. 3865, 24 January 1969, p. 372.

"A federal report recommending research to reduce the potential losses resulting from earthquakes has been released by the Office of Science and Technology. Unlike a 1965 interagency report ... which dealt primarily with earthquake prediction, the present report discusses research on the prevention and minimization of potential earthquake damage through engineering devices, better land use, and subsurface stress relief attempts. The report recommends that the government fund an earthquake hazards study program for a 10-year period at a total cost of $440 million".

("Proposal for a Ten-Year National Earthquake Hazards Program" may be obtained for $3.00 from the Clearinghouse for Scientific and Technical Information, Springfield, Va.).

9. Boffey, P.M., "NSF Budget: Binding Up the Wounds", Science, v. 163, no. 3865, 24 January 1969, p. 369.

Before leaving office President Johnson requested appropriations of $500 million for NSF for fiscal 1970, compared with only $400 million granted NSF for fiscal 1969. "The new appropriations requested, when combined with various recoveries and unobligated balances carried forward from previous years, would give NSF a total obligational authority ... of $520.3 million in fiscal 1970. This would be the highest total in the history of NSF, and would represent a substantial increase from the $435 million available in 1969. Most of the increase would go to scientific research support and institutional support ... Support of research projects would be boosted to $195 million, up $17.7 million from the current year. Most of this boost, namely $10 million, is allocated for interdisciplinary research, both basic and applied, relevant to problems of our society and the modern environment. This is virtually the only significant new departure in a spending program that NSF officials characterize otherwise as "pretty much a standstill budget, "designed to bind up wounds. Other substantial increases are budgeted for the International Biological Program ($5 million requested, up from $0.5 million this year); the National Sea Grant program ($10 million, up from $6 million); the Ocean Sediment Coring Program ($6.5 million, up from $2.5 million); Computing Activities in Education and Research ($22 million, up from $17 million); and university science development ($30 million, up from $20 million).

10. Walsh, J., "NSF: Funds Augmented, but Uncertainties Linger On", Science, v. 163, no. 3868, 14 February 1969, p. 660.

President Nixon announced a $10-million elevation of the ceiling on spending which was imposed on NSF last spring. "The latest increase brings the amount NSF can spend during fiscal year 1969, which ends on 30 June, to about $490 million. This is some $30 million less than the $250 million in spending authority NSF anticipated before congressional budget cuts and administration spending limits were applied last spring. The Nixon action was the second emergency transfusion. In November, the Johnson Administration had released $17 million in 'rescue' funds to cushion the effect of spending restraints which seem to have fallen most heavily on NSF's university clients". Currently a number of uncertainties beset the foundation, and some of these stem from unmade decisions awaiting action from the President. Not only the question of NSF directorship remains hanging, but the whole top echelon of NSF positions remain unfilled. The amendments to the NSF basic law passed last spring provide that the NSF director's five top aides be Presidential appointees. Also, as a result of the amendments, NSF faces its first authorization hearings. "For the first time the agency is facing a program-by-program examination of its activities, to gain an authorization for its fiscal 1970 appropriation".

IV NATIONAL R&D PROGRAMS

1. "Marine Science Affairs -- A Year of Broadened Participation", The Third Report of the President to the Congress on Marine Resources and Engineering Development, January 1969, 251 pp.

   This report summarizes major policy recommendations of the Marine Sciences Council and outlines objectives of a long-range national program. Federal activities and programs are described according to purpose, for example, food supply, national security, coastal-zone management, trade and transport, and international cooperation. Three new policies or programs are discussed: 1) the International Decade of Ocean Exploration, 2) a long-term policy framework for the Sea Grant Program, and 3) development of an arctic policy. Basic areas of recommended support include surveying of the ocean environment, for example, charting and geodesy; information management and collection of environmental manpower training. In view of the complex interrelationship of marine science and socio-economic interests, the Council recommends development of national policy planning to coordinate the activities of knowledge-generating and knowledge-consuming institutions "to match needs and opportunities. Policy planning has focused on imperfect articulation between participants, to identify and where possible dissolve inadvertent impediments to the smooth application of marine discoveries".

   (This report may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.25).

2. "Our Nation and the Sea", A Plan for National Action, Report of the Commission on Marine Science, Engineering and Resources, January 1969, 305 pp.

   The final report of the Commission on Marine Science, Engineering and Resources is reviewed. A plan for national action is discussed with regard to oceanic and atmospheric research and technology. A primary recommendation of the Commission is to establish an agency, the National Oceanic and Atmospheric Agency (NOAA), "to provide the means for undertaking the full range of actions needed to realize the Nation's growing stake in the effective use of the sea". Repeated emphasis is given to the following policy recommendation: "Private investment capital is available for ocean ventures, and industry neither desires nor requires direct Government subsidy. Industry must, of course, depend on the Government for many kinds of support and services ... The Commission urges that Government research and development programs be planned and administered to enable industry to assume the responsibility for the further development of technology at the earliest possible stage. Participation by industry in all phases of the recommended program will aid in identifying wholly new directions of commercial enterprise". The appendix to the report includes a list of specific recommendations for the various fields of ocean science and technology.

3. "Oceanographic Agency Proposed", Industrial Research, v. 11, no. 2, February 1969, p. 25.

A presidentially appointed commission recently released a report calling for the "creation of a new civilian organization, known as the National Oceanic & Atmospheric Agency (NOAA) and a buildup of federal spending from the current level of less than $500-million a year to more than $1 billion by 1980". "The organization -- which faces close congressional scrutiny before implementation via new legislation -- would combine six existing activities: The Coast Guard ... Environmental Science Services Administration ... The Bureau of Commercial Fisheries, and salt-water oriented elements of the Bureau of Sport Fisheries & Wildlife ... The National Sea Grant Program ... The U.S. Lake Survey ... The National Oceanographic Data Center". "Total employment would be 55,000, some 42,000 coming from the Coast Guard. Thus personnel complement would make NOAA the largest government agency below cabinet-level status. The involved organizations have a combined budget for the current fiscal year of $773-million. All told, they have 39 federal laboratories, 320 research vessels, and a fleet of research aircraft". "The merger is being billed as the creation of a new agency greater than the sum of its parts in the sense that it will serve as a catalyst for the lagging national marine effort". "Its principle value lies in its orientation to practical problems ... rather than science for its own sake". "Despite bipartisan support in Congress and a generally favorable reaction by the incoming administration, chances that the legislation will pass this year are very slim".

4. Wenk, E., Jr. and Drewry, J.M., "When Do We Accept the Challenge of The Sea?", Undersea Technology, v. 10, no. 1, January 1969, pp. 48-50.

The article presents, as background "for a new year in Federal government policy and legislation" (on oceanography) comments by the Executive Secretary of the National Council of Marine Resources (Wenk) and the Chief Council of the House Committee on Merchant Marine and Fisheries (Drewry). According to Wenk "we are witnessing a modern renaissance -- a return to the sea prompted by three major developments:" (1) "an unprecented mandate of the Congress to improve scientific comprehension of the oceans ...", (2) "an emerging interest among all nations in utilizing dormant resources of the sea ...", and (3) "contemporary technology can now make these universal desires a reality". Despite an "unhospitable budget era", the FY 1969 budget is estimated at "$485 million for marine sciences; up 9 percent from FY 1968, and up 35 percent from FY 1966, during which time Federal R&D as a whole increased only 8 percent". Drewry cites past congressional actions in oceanography and concludes that we "have a viable National Oceanographic Program definitely underway".

5. Treadwell, T.K., "Oceanography Needs More Practical Goals", Undersea Technology, v. 10, no. 1, January 1969, pp. 40-41,50 & 52.

The author mentions some of the programs being carried out by the Naval Oceanographic Office and suggests that "the management philosophy which shaped these programs offers a key to the next phase of growth for oceanography. That key is usability". In operational oceanography, every activity must contribute to some practical end; it may be immediate or it may be longer term, but it must be there". If oceanographic research does not produce some usable information, public and government interest may "flag even further, with obvious effects on the fate of oceanography". The relevance of oceanography to public service and military applications is discussed as well as basic research of economic potential, such as Global Ocean Floor Analysis and Research (GOFAR). "While basic research is still needed, it is no longer the answer. It must be supplemented -- perhaps almost superseded -- by applications engineering".

6. Normyle, W.J., "NASA Molding Post-Apollo Plans", Aviation Week & Space Technology, v. 89, no. 26, 23 December 1968, pp. 16-17.

The "post-Apollo manned space flight program is being molded into a potential $10-billion effort aimed at a mid-1970s orbiting station coupled with reusable ferry systems applicable to both civilian and military uses". A systems analysis of post-Apollo efforts is scheduled; requests for proposals (RFPs) from industry are supposed to be out by 1 January. Seven million dollars will be allotted for the study effort, which includes: 1) "conceptual definition of a large semi-permanently orbiting space station with a minimum crew of nine men", 2) "selection of the most feasible launch vehicle for the station, with proposals centering around some modification of the Saturn system capable of launching 80,000-150,000 lb. into earth orbit", 3) "review of alternative space shuttle systems that could carry rotating crews and supplies between the station and the earth", 4) "recommendation of the launch vehicle for the shuttle", 5) miscellaneous supporting studies involving information management, development of experiment modules that could be used to expand the space station and definition of space requirements". "Of the $7 million that will be used for the forthcoming efforts, NASA will concentrate $6 million on the space station and shuttle concepts together with the requisite launch vehicles. The remaining $1 million will be for the miscellaneous efforts. In addition, $3 million will be spread throughout the agency ... to help in defining experiments that could be used on the space stations". The remainder of the article discusses some of the programs in detail.

7. Normyle, W.J., "Alternatives Open on Post-Apollo", Aviation Week & Space Technology, v. 90, no. 2, 13 January 1969, pp. 16-17.

   NASA has requested proposals for a "[p]ost-Apollo earth orbiting manned space station" to be patterned on three basic configurations. The study contractors will be free "to choose alternatives, including new systems and hardware". The potential cost of the post-Apollo program is $10 billion. Previous studies are still "firm guidelines" and NASA will not accept less flexible concepts than those already established; however, in permitting some design freedom, they hope to generate a modularized concept "that would permit extensive growth of the space station in orbit". The three basic configurations (the Modular A Space Lab, the Mission Operational Module, and the Manned Orbiting Workshop) have the following requirements: (1) "qualification of man and systems for long-duration space flight in orbit", (2) "demonstration of man's ability and functional usefulness in performing scientific and engineering experiments", and (3) "periodic rotation of crews and resupply of the space station". The basic concepts are intended to provide operational flexibility and operation with "separately launched payload modules or unmanned and unattended". These requests for proposals are "Phase B of the manned orbiting space station envisioned by NASA". The advanced manned missions office of NASA has planned about $7 million for the contracts.

8. Normyle, W.J., "Pace of Post-Apollo Planning Rises", Aviation Week & Space Technology, v. 90, no. 5, 3 February 1969, p. 16.

   The Post-Apollo planning activities, which are rapidly being formulated to insure the continuance of manned flight and lunar exploration, are discussed. Activities include (1) "Completion of requests for proposals (RFP's) for the earth-orbital space station", (2) "Issuance of RFP's ... for an intermediate-size post-Apollo lunar landing logistics spacecraft", (3) "Evaluation of proposals submitted for the dual-made lunar roving vehicle", and (4) "Review of designs of one-man lunar flying vehicles to select a major mobility/rescue concept". The effort is "to ensure that that NASA ... has some basis for continuing manned space flight" and to prevent a "threatened gap in U.S. manned space flight capability". New hardward systems include an unmanned soft-lander to put a variety of useful payloads on the moon. The soft-lander system is planned for mid-1973 and beyond. In addition, the Manned Spacecraft Center plans a review of its one-man lunar flying designs, for which dual contracts have been awarded to Bell Aerosystems and North American Rockwell. "Each $250,000 contract is to be completed by July 2, with plans for a combination development/production effort to be initiated in Fiscal 1970 if funding is approved".

9. Carter, L.J., "Earth Resources Satellite: Finally Off the Ground", Science, v. 163, no. 3869, 21 February 1969, pp. 796-798.

The applications and development of the Earth Resources Technology Satellite (ERTS) is discussed. Emphasis is given to its usefulness in providing an international data service for a variety of purposes: improvements in cartography, surveying and monitoring of water supplies and pollution; identification of geologic areas for mineral development, and crop and vegetation surveys for early detection of plant disease. This type of service depends on remote-sensing devices, most of which are still in the development stage. The sensing equipment would include high-resolution TV cameras, side-looking radar, and thermal-infrared and passive microwave sensors. Congressman Joseph Karth, Chairman of the House Subcommittee on Space Science and Applications feels that the ERTS is NASA's most promising project and building it is long overdue. Attempts to initiate the program date back to 1966 and were led by the U.S. Geological Survey; "NASA ... had begun developing remote sensing devices for earth resources studies in 1964", but the project was omitted from NASA's plans in 1966. Current tentative launching dates of ERTS are late 1971 or early 1972.

10. "IBP Streamlined", Nature, v. 221, no. 5179, 1 February 1969, pp. 400-401.

The United States International Biological Program (US IBP) has reorganized its Academy of Sciences supervising and advisory committee system and its membership. A newly formed executive committee for the US IBP is a six-man affair with Frank Blair as chairman. "It is supported by two other committees, PROCOM, the Program Coordinating Committee, and INTCOM, the International Coordinating Committee. Altogether the reshuffle has pared the membership of the committee from about 100 people to thirty". "The committee has also now fixed the outside limits of its programme 'envelope' and has announced to the scientific community that no further grand integrated projects will be considered". The US program will ask for $5 million for fiscal 1970 from the National Science Foundation -- it "is expected to get through Congress". "The programme itself is now stablized, with thirteen 'integrated' large scale projects already active, and five more adopted but not yet fully organized. The Academy committee has been at pains not to close the door on further promising research subjects which scientists may wish to press, but only on grandiose proposals spanning large areas and many disciplines. Thus it is pointed out that the US IB programme could take on a study of the effects of defoliation in Vietnam ... but it would not rank as a programme in its own right".

11. "U.S. IBP: Away and Running in 1970?", Scientific Research, v. 4, no. 4, 17 February 1969, pp. 17-18.

The National Science Foundation has requested $5 million in its 1970 budget for the U.S. contribution to the International Biological Program (IBP). The five-year program will expire in 1972 and the U.S. "has thus far failed to make a substantial contribution to it". The figure was originally $8 million, pared to $5 million in former President Johnson's budget; even so, it is "only a fraction of the $30.9 million the U.S. IBP committee considers the optimal figure for one year's research". Representative Emilio Daddario and his subcommittee on science research and development are expected to support strongly the IBP committee's request for funds. The stall in funding is attributed to inadequate explanation by the U.S. IBP Committee to the Senate regarding the benefits of the IBP. Some Washington sources feel that "unless a senator with the prestige of Kennedy takes a real interest in the IBP this year, the U.S. part of it will not get Senate endorsement". The $5 million request will support three U.S. ecological programs planned by the NSF: (1) a study of grasslands areas, (2) a study of eastern deciduous forests, and (3) a study of western coniferous forests.

V SCIENCE, EDUCATION, AND THE UNIVERSITY

1. "Toward a Public Policy for Graduate Education in the Sciences", First Report of the National Science Board, National Science Foundation, Washington, D.C., NSB 69-1, 1969, 63 pp.

   The status of graduate education in science is assessed in this report and outlines of national policy "for the support and strengthening of graduate education in the sciences and engineering" are presented. Because of the expected rapid growth of graduate education in the coming decade, the "guidance and focus of an explicit national policy directed to its distinctive character" is considered necessary. "The responsibility for implementing a national policy for graduate education is shared by the educational institutions, State and regional organizations, and the Federal Government". Recommendations include the following: (1) Institutions initiating or expanding their graduate programs "should base their decision on strong academic departments, already in existence, and on the availability of adequate resources to be committed to the graduate program". (2) "Encouragement should be given to the development of multidisciplinary graduate programs". (3) "The Federal Government should accept a continuing responsibility for a significant share of the total support of graduate education". This support "should supplement, not replace non-Federal sources of funding". "Six types of grant programs are proposed": (1) Insitutional Sustaining Grants, (2) Departmental Sustaining Grants, (3) Developmental Grants, (4) Graduate Facilities Grants, (5) Graduate Fellowships, and (6) Research Project Grants. All but the first of these grants would be "awarded on the basis of appropriate national competition".

   (This report can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price 40 cents).

2. "Graduate Education: Parameters for Public Policy", National Science Board, National Science Foundation, Washington, D.C., NSB 69-2, 1969, 168 pp.

   "This volume presents the statistical evidence, forward projections, analyses, and interpretations which underlie the conclusions and recommendations offered in the First Report of the National Science Board entitled Toward a Public Policy for Graduate Education in the Sciences". "Although the report has not been addressed to delineation of issues of public policy, many of these issues are implicit in the material reviewed". Chapter I, Dimensions of Graduate Education, presents some of the salient features of institutional demography, including number of graduate institutions; their types, locations, etc. In Chapter II, Correlates of Quality, "graduate institutions of high quality are characterized, the costs of developmental programs to improve quality are estimated, and the geographic distribution of graduate education of high quality is summarized". In Chapter III, Financial Perspectives, "important financial patterns and trends in universities are examined, together with several fundamental characteristics of the academic scene that appear to have been the source of serious misunderstandings in the formulation of public policy and the determination of the Federal role in relation to the institutions of graduate education". The final section contains a listing of many of the principal conclusions, "including especially those having policy import", that can be formed from a review of the material presented in this report.

(This report can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $1.25).

3. "NYAS Crisis Report Out", Chemical & Engineering News, v. 46, no. 54, 26 December 1968, pp. 11-12.

An ad hoc committee of the New York Academy of Sciences recently released a report entitled, "The Crisis Facing American Science", an evaluation of federal support of science. "Besides a general statement on how reduced federal support is holding up potential solutions to the 'most pressing problems of modern society' and a nationwide survey of 84 academic institutions and comments from 193 of the academy's 20,000 American members, the report includes a number of recommendations and identified problem areas". Specifically, the committee recommends: (1) "Taking short-term corrective action within the Federal Government to offset the critical short-term effects of funding cutbacks", (2) "Setting an annual growth rate of 15% for federal spending on scientific research", (3) "Improving methods of consultation and communication between Federal Government and the scientific community", (4) "Establishing a long-term, multi-year basis for the federal scientific research budget". The three crucial problem areas are: (1) "Training scientific manpower to preclude a serious shortage in the near future", (2) "Continuing support of ongoing projects of merit", (3) "Granting funds to programs involving new concepts ideas". "Funds for these problems areas could come from two temporary sources ... One involves appropriations earmarked for capital expenditures, and the other diversion of funds from unendangered, well-funded programs to crucial programs".

4. "Scientists on Campus Flunk in Federal Aid", Business Week, no. 2053, 4 January 1969, pp. 76-79.

The slash in fiscal 1969 funds for university research is a "'financial crisis in science', that not only impedes or imperils present research programs, but also threatens to curtail development of scientific manpower for future projects". The overall effects of the cuts in federal research support are discussed. "The biggest blow to university researchers is the cutback in grants from the National Science Foundation. NSF now will allow campus scientists to spend an estimated $368 million -- up $10 million from fiscal 1968". "Furthermore, research costs are rising -- by 8% a year .. So long as NSF grants stay at their present level, this means that research will actually lose ground". "Universities have found the money to maintain most projects involving graduate students in order to keep them in school. But research administrators may start losing many ... in February, when draft call-ups are expected to rise steeply. Hardest hit so far seem to be the young PhDs ... who ... can't get government funds to launch their own projects. Overall some projects have been toned down. Money is being deferred. So are purchases of expensive new electronic equipment". This article also discusses the varied impact of the budget cut on research quantity and quality and how this varies with the size and type of institution. The remainder of the article is concerned with how the scientific community can be assured of knowing in advance the funds that will be available for the following year.

5. "Young Scientists Not Badly Hurt -- As Yet", Scientific Research, v. 4, no. 2, 20 January 1969, pp. 13-14.

Although "universities have done some adroit shuffling of their resources to shield their graduate students" from the financial crises, "The federal budget pinch will almost certainly continue into fiscal '70". Those students who do escape the draft will find financial assistance tighter than it has been in years. "Between July and the end of November this year, 2,271 proposals for continuation of existing research and for new projects were received by the NSF. This compares with 2,757 during the same period of 1967 and 2,552 in the same period of 1966". NSF fellowships and traineeships this year will number about 8,900 compared with 9,300 in 1968. Institutional grants are dropping from more than $51 million in 1968 to about $35 million this year. "Some 300 of the 500 universities affected by the NSF ceiling on spending are appealing their limitations". $27 million is available for settling such appeals. "The NIH's budget request for fiscal '70 was reported to be close to $1.1 billion for its nine institutes -- virtually the same sum that was appropriated for '69". "The number of NIH fellowships for '69 and '70 is likely either to remain unchanged or go down from previous years". "NASA graduate fellowships used to be another source of funds for young scientists, but after a series of cuts from a high of 1,400 fellowships a year the program went out of existence at the end of fiscal '68". The remainder of the article discusses the financial situation at Columbia, Carnegie-Mellon, Illinois and Stoney Brook.

6. "Survey of the Draft Status of First and Second Year Science Graduate Students, Fall, 1968", Scientific Manpower Commission, Washington, D.C., 1969, 28 pp.

The Scientific Manpower Commission reported that almost half of all first- and second-year, full-time male science students are "potentially liable for induction in the months ahead". The survey was based on data from 1,237 science departments offering the Ph.D. degree and applied also to graduate students employed as science teachers and as full- or part-time researchers. The Commission warned that "Unless present draft regulations are modified, the number of U.S. males now engaged in advanced scientific training in the nation's graduate schools will be substantially reduced during the coming months. Adequate numbers of graduate teaching fellows to assist undergraduate students may not be available in many universities, and research projects now underway may be delayed or curtailed by the loss of graduate research assistants".

(This survey can be obtained from the Scientific Manpower Commission, 2101 Constitution Ave., N.W., Washington, D.C. 20418, Price $2.00).

7. "More College Graduates Drafted", Science, v. 163, no. 3868, 14 February 1969, p. 656.

"The percentage of draftees who are college graduates with at least one degree has risen substantially. The Department of Defense told Science that in June of last year 4.5 percent, or 1100 of the 24,600 draftees were college graduates. By October about 20.4 percent, or 3800 of 13,700 draftees were college graduates. The Scientific Manpower Commission attributes the increase to the change in graduate deferment regulations, which has had the effect of making students with one degree prime targets for the draft; it is also due to the increased number of students who have exhausted their rights to appeals and postponements. The Defense Department has released a 79-page handbook, Pathways to Military Service for College Men and Women, which describes opportunities in the military service for college-educated persons. Reference copies are available at university placement offices".

8. "Support and Research Participation of Young and Senior Academic Staff, 1968", National Science Foundation, NSF 68-31, Washington, D.C., 1968, 31 pp.

This is a report on a survey initiated by the National Science Foundation in mid-1968 to collect data and opinions from heads of departments in selected fields of science and engineering concerning the research involvement of young and senior academic faculty members. "The survey questions dealt with the overall composition of faculty, the fraction of time spent on research and the funding patterns related to research". Interviews were also conducted to indicate "both the need and feasibility for a systematic collection of quantitative data to determine the extent of research participation problems". Some of the findings include: More of the young Ph.D.'s were devoting 20 percent of their time to research than were the older Ph.D.'s; 70 percent of the senior investigators and 57 percent of the junior investigators were in research connected with Federal grants or projects. The survey also indicated concern that younger faculty members were not performing enough research. Reasons given for this were inadequate funds, time, equipment, and that mechanisms for allotting funds discriminated against the younger members. One-fourth of the department heads in six fields felt that neither the young or senior investigators were given enough freedom in selecting their research area. Recommended changes in research support programs included provision of specific programs and equipment for the young investigators, allocation of available Federal funds to institutional, departmental or block grants, and allocation of currently available funds to research projects.

(This report can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price 40 cents).

9. "No Drop in Campus Research for DOD", Scientific Research, v. 4, no. 3, 3 February 1969, p. 20.

"Despite increasing student and faculty protests, most American universities have not decreased their research for the Department of Defense. New DOD figures for fiscal 1968 show that universities and non-profit institutes maintained a 10 percent share of the Department's $6.5 billion '68 r&d budget. The rest was spent by industry and DOD research establishments. Several major universities, such as Caltech, Harvard, Princeton, Northwestern, and the University of Pennsylvania, did cut their volume of defense contracts sharply from fiscal 1967. But other schools -- the Universities of Florida and Alaska, and Oregon State, and Louisiana State -- have filled the void". The number one university defense contractor is Massachusetts Institute of Technology ($119 million); the Aerospace Corporation is second

($73 million). Rounding out the top 10 are John Hopkins University ($58 million), Mitre Corporation ($36 million), Stanford Research Institute ($29 million), the Rand Corporation ($17 million), Systems Development Corporation ($17 million), Stanford University ($16 million) and the University of Rochester ($13 million). "These positions did not change appreciably from fiscal 1967, except for Rochester, which jumped from 90th to 10th when it took over management of the Center for Naval Analysis in Virginia". The remainder of the article lists the shares of university contracts going to different states.

10. "NSF Institutional Grants Change", Science, v. 163, no. 3866, 31 January 1969, p. 459.

"The National Science Foundation (NSF) has broadened the base of its institutional grants for science programs, thus making a larger number of the less affluent universities eligible for the grants. NSF plans to change its method of calculating institutional grants by including university research awards of other federal agencies. (NSF's institutional grants for science are not awarded for a specific purpose and may be used by the university for any scientific project it chooses.) The institutional grants until now have been awarded to universities as a variable percentage of the total NSF grants given. The change in the NSF formula will now mean that institutions with substantial support from other federal agencies will probably receive larger NSF grants than in recent years, while those receiving grants primarily from NSF may be reduced. NSF officials told Science that the change in the formula, instead of the base, will make as many as 100 more institutions eligible for institutional grants".

11. "NASA Drops 16 Universities", Scientific Research, v. 4, no. 1, 6 January 1969, pp. 15,17.

The budget squeeze forced NASA to drop 16 institutions from its Sustaining Universities Program. "Four other universities were dropped last year; 30 remain. The program issues institutional grants to help universities build up their research capabilities. The interdisciplinary grants do not cover specific research projects. Contracts of the 16 universities dropped will not be renewed ... unless the institutions come up with exceptionally good research proposals, in which case the money would probably have to be taken from other universities. Grants to the 16 have ranged from $75,000 to $300,000; the total saving will be $4 million over fiscal years '69, '70, and '71. Program funding has declined from the high of $45 million in fiscal years '65 and '66 to $30 million in fiscal '69, $10 million in '68, and $9 million this year. The budget level for fiscal '70 is expected to be $9 million. The 16 universities being dropped are: Caltech, New Mexico State, Montana State, Florida, Oklahoma State, Oklahoma, Maine, Georgia Tech, Purdue, Colorado State, Washington at St. Louis, Louisville, Brown, Missouri, Minnesota, and Arizona. Those dropped last year were: Adelphi, Kansas State, Indiana, Pennsylvania".

12. "A Government-Wide Formula for Overhead on Research Grants?", Scientific Research, v. 4, no. 3, 20 January 1969, p. 23.

    "Should there be a government-wide formula for indirect, or overhead, costs charged back to the government by holders of federal research grants? This is one of the most important questions the General Accounting Office (GAO) will try to answer in a crash study it's making for Congress on the controversial question of research overhead on grants (research contracts are excluded) ... The GAO report ... may have a hearing on whether and how Congress will try to put a ceiling on overhead charges, or otherwise try to limit them ... GAO officials say they may also raise some questions about the instruments used by federal agencies to sponsor research. They want to know, for example, why the Atomic Energy Commission sponsors all of its university research under contracts while the National Science Foundation dispenses its funds almost entirely under grants".

13. "Waiting on H.R. 35", Chemical & Engineering News, v. 47, no. 11, 10 March 1969, p. 11.

    The U.S. Office of Education (USOE) has decided to defer action on H.R. 35, "a bill to establish a system of unrestricted institutional grants to improve the quality of graduate science education". The principal reason for witholding action is that USOE is making "a massive study of federal programs of aid to education", which includes aid to higher education, and "any action [on H.R. 35] would be premature until the studies ... had been completed". Last year at hearings on a similar bill USOE also asked Daddario's Subcommittee on Science, Research and Development "to defer action until a certain study had been completed". "Regardless of the outcome of studies on federal aid for higher education USOE does not like H.R. 35. The reason for the opposition is that aid is restricted to the sciences both 'hard' (physical sciences) and 'soft' (social sciences). 'By limiting its application to the sciences, H.R. 35 deals with only a small part of the problem facing colleges and universities today ... [and] has the potential of creating more problems for some institutions than it would solve'". "The recent reports on federal aid to higher education also tend to downgrade the grant program proposed in H.R. 35 ... One study is HEW's so-called Rivilin report; the other is the report of the Carnegie Commission on Higher Education. 'Neither of these studies placed institutional support at the head of its recommendations for federal assistance to colleges and universities ... Rather, both made student financial aid a matter of highest priority'".

14. "Columbia to Study NASA Law", Science, v. 163, no. 3866, 31 January 1969, p. 459.

"A faculty committee at Columbia University is studying the implications of a federal law that could deny National Aeronautics and Space Administration (NASA) research grants to schools that bar military recruiting on their campuses. The statute, part of the 1969 NASA authorization act passed on 3 July 1968, will be examined by Columbia's Committee on Externally Funded Research and Instruction, a faculty group established last October to insure that research funds from nonuniversity sources do not violate Columbia's academic goals. The action over the NASA research statute was generated when students assailed military recruiting efforts on the Columbia campus last week. University officials estimate that Columbia derives about $72 million a year from government sources, $1.2 million of which comes from NASA".

15. "Commission on Engineering Education Becomes Unit of Engineering Academy", News Report, v. 19, no. 1, January 1969, pp. 1,7.

The Commission on Engineering Education, Inc. recently became the Commission on Education of the National Academy of Engineering (NAE). "The move is expected to strengthen the programs of the Commission. At the same time, the NAE will be able to draw on the experience and established projects of the Commission as it begins work on educational needs. The Commission on Engineering Education was one of seven commissions organized several years ago as a result of a charge to the National Science Foundation (NSF) to become concerned with the far-reaching problems of improving undergraduate education in the sciences, mathematics and engineering. NSF gave initial funding to establish a small office and hold exploratory meetings of engineers from industry and education. Most of the programs that materialized were separately financed by NSF or private foundations and eventually turned over to another organization for continuation of dissemination, with the Commission continuing as an adviser, monitor, or coordinator". The "Commission is now moving toward the broad concept of educational systems design and the interface between engineering education and the social and physical sciences". Specific programs of the Commission are cited.

VI SCIENCE MANAGEMENT AND POLICY-MAKING BODIES

1. Nelson, B., "Science Adviser DuBridge Makes His Press Debut", Science, v. 163, no. 3869, pp. 794-795.

   The first official "round table discussion" on the problems of science, the universities, and graduate education between President Nixon and his Science Adviser DuBridge is discussed. Topics of discussion included: (1) NASA, the Department of Defense, and the National Space Council are charting "new directions, new goals, and new programs for the entire United States space program" for the post-Apollo decade. Recommendations will be delivered to the President by 1 September. (2) The President has asked his office to give an opinion on "the value and justification" of the 200-GeV accelerator at Weston, Illinois; he hopes Congress will approve this year's $100-million budget request for the beginning stages. (3) A panel of the President's Science Advisory Committee will be submitting a "highly secret report" on ABM, which examines the pros and cons of various technical alternatives; the report represents "3 or 4 years of work". (4) The Nixon Administration is still looking for new leadership of NASA and NSF. (5) A special panel on the Santa Barbara oil leakage has been assembled "to determine the geological source of the leak and the biological and environmental consequences and to recommend how such damage can be avoided in the future". (6) DuBridge's office has also been asked "to help examine the Marine Sciences Commission report and Telecommunications Taskforce report".

2. Boffey, P.M., "The Hornig Years: Did LBJ Neglect His Science Adviser", Science, v. 163, no. 3866, 31 January 1969, pp. 453-454,456-458.

   This article presents an assessment of Dr. Donald F. Hornig's five years as science adviser to President Johnson. Interviews with more than two dozen people such as White House staffers, federal agency officials, Congressional sources, and members of Hornig's staff comprise the basis for the article. "... [E]valuations are somewhat mixed, but the consensus seems to be that Hornig was neither a superlative success nor a resounding failure". "... [T]hose who question his accomplishments are quick to point out that most of the blame for any alleged shortcomings lies less in Hornig than in forces over which he had little control -- notably the Vietnam War, the growing public and Congressional skepticism toward the mammoth R&D budget; and the complicated, cantankerous personality of President Johnson". Accomplishments during Hornig's tenure include: expansion and diversification of the White House science advisory apparatus; doubling the budget of the Office of Science and Technology (OST) from $900,000 to $1.8 million, and increasing the size of its full-time professional staff from 15 to 21; diversifying the President's Science Advisory Committee (PSAC) to include representatives from new disciplines, professional backgrounds and geographic areas. Other major operations Hornig is given major credit for include: "sparkling federal research programs in housing and transportation"; "developing a new law designed to encourage medical schools to expand their production of doctors", etc. "The most significant criticisms ... generally involve things he allegedly failed to do rather than things he did. These include: "not developing plans for science and technology in the post-Vietnam period"; not being "very creative or innovative", "did little to cultivate the power centers of a Congress that became openly hostile to R&D funding; and that Hornig was a poor administrator who tried to do too much himself and failed to use his staff as effectively as he might have".

3. Wolfle, D., "Science and Engineering Policies in Transition", <u>Science</u>, v. 163, no. 3864, 17 January 1969, pp. 306,308,310.

The recent seminar on "Science and Engineering Policies in Transition" held by the Carnegie Institution of Washington is discussed. "Three topics made up the agenda: policy problems of federal government support of science and technology in a period of major transition; some shortcomings of present institutions for the federal support of science; and some possible improvements in current institutional arrangements". The seminar agreed on three changes that seemed desirable: (i) greater flexibility in the use of federal and contract laboratories to adopt their facilities and skills to changing needs; (ii) less separation between fundamental and applied research in an area; and (iii) stronger efforts to develop priorities in the allocation of limited financial support". Topics also covered in the seminar included: generalizations concerning the processes by which priorities are established, evaluated, and changed; the value of competition in the analysis and recommendation of science policy; the need for better-oriented policy studies; the possibility of new and better institutional arrangements such as a Department of Science, and the possibility of establishing competing sources of policy studies and ideas.

4. Jul, M., "Selecting Priorities for Major Research: A European View", American Management Association Bulletin, pp. 3-20.

The author discusses reasons industry and "industrial research should welcome Big Science as an important factor in the development of modern society". "The most important thing that industrial management can do is to press wherever it can for a better selection of projects worthy of Big Science". (Big Science refers to projects in space exploration, atomic energy research, and high energy physics). "A thorough study ... would probably indicate that ... our method of selecting Big Science projects has been unsatisfactory". Jul makes reference to several neglected areas with pressing problems which appear "much graver than any of the problems that Big Science has decided to attack". Some of these areas include: starvation, peace, urban traffic, air and water pollution and educational methods. The author contends that it "is up to industry to state its case and suggest to governments which projects they should consider ... other circles in society, notably the medical profession and the sociologists ... should appeal to government for Big Science projects in their disciplines ... industry should insist on better instruments for co-operation between Big Science and industry and for the efficient transfer of scientific results to industry". This article also includes: a historical development of Big Science and its relationship to the government and society's needs; justification for Big Science and the 'glamour' factor, limitations of Big Science, including funds, project selection, selection criteria and the effects of present selection methods.

5. "GAO Scores Research Centers", Science, v. 163, no. 3869, 21 February 1969, p. 793.

"Think tanks and other research centers which do business with the federal government come under fire in a General Accounting Office (GAO) report to Congress titled "Need for Improved Guidelines in Contracting for Research with Government-Sponsored Nonprofit Contractors". The report calls for government-wide guidelines on the amounts and use of 'fees' or management allowances given by the Defense Department, NASA, and the AEC to federal contract research centers. The GAO found that allowances paid to nonprofit organizations varied significantly, were not being much used for the conduct of research, and had been spent by some centers, including IDA, MITRE, and RAND, to acquire extensive capital facilities. The report also noted that RAND uses its fees to let its employees fly first-class trips of more than 1-1/2 hours, contrary to regulations restricting the use of first-class accommodations for government employees and contractors. The report also stated that Aerospace Corporation had used its fees for paying executive salaries which are excessive". "The use of government funds by federal contract research centers has been criticized in Congress in the past and is expected to receive congressional attention again this year".

6. Carter, L.J., "National Data Bank: Its Advocates Try to Erase 'Big Brother' Image", Science, v. 163, no. 3863, 10 January 1969, pp. 160,162.

   Whether the U.S. government should establish a statistical data center or "national data bank" has resulted in considerable congressional attention primarily because of the center's potential for invading personal privacy. This article presents one of the principal aims of the center and discusses recent safeguards suggested by Gallagher's Special Subcommittee on Invasion of Privacy. "Such a data center ... would be intended to serve ... scholars and other users of gross statistics. One of its principal aims would be to help economists, other social scientists, and government specialists investigate major economic and social problems, such as those of persistent unemployment and social disorganization in the big-city slums". The Gallagher subcommittee issued a report recommending several safeguards be asserted in designing and setting up the data bank, in particular the "priority of privacy". It also recommended that: (1) "the data center itself keep data largely in the aggregate and keep none on identifiable individuals"; (2) "the data bank not be set up in any existing federal agency, but that it be placed under its own supervisory commission and removed as far as possible from the political pressures of an incumbent administration". If "the subcommittee goes along with the data-bank concept as now revised [the center will employ the recommended safeguards for privacy, but periodic reviews of the center's operations and safeguards will be conducted by a number of agencies], this might brighten possibilities of Congress' authorizing a data center. Establishment of such a center ... would be particularly significant if it led a thorough review of the practices of all federal data gathering agencies, including the Internal Revenue Service and the FBI".

7. "Secrecy and Dissemination in Science and Technology", Science, v. 163, no. 3869, 21 February 1969, pp. 787-790.

   This article discusses "the conditions essential to the very existence of science" in terms of both the positive and negative effects of secrecy and security regulations. The author points out that there are "frequent demands for secrecy in the handling of research in connection with national defense, national economic self-interest ... and the need to provide privacy during the early stages of work by scientists and research groups. Whenever restrictions on the dissemination of information are put into effect, there will be delays in the communication of research findings, in the operation of the self-corrective scientific process, and in the initiation of steps that lead to further discoveries". These restrictions "impose intolerable burdens and limitations on scientific research ... the price is paid not by the scientific community alone but by the whole society". "In our view it is not secrecy as such that threatens the integrity of the scientific process, but excessive and inappropriate uses of secrecy which are the outcome of the present overconcentration of power. Protective measures against the extension of regulations limiting disclosure are necessary, but they are not enough. It is equally essential to develop methods of dissemination and critical appraisal appropriate to the exponential growth of science and technology. Our task is to define, protect, and institutionalize the processes of science and technology so that they will contribute to the well-being of the whole of mankind".

8. "Another Reorganization at the NIH", Scientific Research, v. 4, no. 1, 6 January 1969, p. 12.

   "Phase two in the reorganization of the National Institutes of Health [NIH] was put into effect last month by the outgoing Secretary of Health, Education & Welfare, Wilbur Cohen". The principal changes include: a reshuffling of NIH's top staff jobs and creation of the new National Eye Institute; and the addition of NIH's tenth institute, the Institute for Environmental Health Sciences. "As a result of the realignment, the NIH will have a second deputy director -- for science -- whose responsibility will scientific programs for all nine institutes. The post will go to Robert W. Berliner, who has served since June as NIH's senior scientist in charge of in-house and contract research operations. In his new post, Berliner will worry about all of NIH's research, including its extramural grant programs -- but he will be more concerned with formulating policy than with the administration of specific programs. In effect, he will be the No. 3 man at NIH".

9. "Progress of the United States Government in Scientific and Technical Communications -- 1967", Committee on Scientific and Technical Information of the Federal Council for Science and Technology, Executive Office of the President, 1968, 99 pp.

   This report briefly describes projects, publications, and activities of the member and observer Agencies' Panels, and Task Groups of the Committe on Scientific and Technical Information (COSATI). "In the preparation of this Progress Report ... the major theme selected to bind the many and diverse government agency efforts and activities together was the growing internationalization of scientific and technical information". Problems facing COSATI are listed and include the following:

- "How can we fashion the growing networks in the government, professional societies, universities, libraries, and industry in such a way as to bring efficiency, economy, maximum use of scarce resources, and.... improved service to the users of scientific and technical information?"
- "How can we provide more resources and leadership to ensure high quality supervision of Federal agency scientific and technical information programs ...?"
- "How can we employ the arts of communications and information-processing to help solve complex problems of society that are hallmarks of this era and that sometimes result from less than adequate communications and information?"
- "How can we mount an education and training program for scientists, engineers, educators and managers to prepare them for the new order of communication ...?"

(This publication is available from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151, in Hard Copy for $3.00 and in Microfiche for $.65).

10. "New Data Group Charges Federal Bias", Scientific Research, v. 4, no. 1, 6 January 1969, p. 13.

The new Information Industry Association (IIA) has charged the National Science Foundation (NSF) and other federal agencies with "explicit and implicit, overt and covert discrimination against the for-profit information organizations". "Leaders of the new group, which was formed last November to promote the interests of commercial information service companies, allege that federal agencies award their grants and contracts for abstracting, indexing and other types of information services almost solely to large and prestigious nonprofit scientific societies". "Spokesmen for the National Institutes of Health and the Atomic Energy Commission flatly deny the charge of discrimination. But an official of the NSF ... admitted that although its policies are not intentionally discriminatory they may work out that way". "The NSF views its missions as 'supporting progress in science, not helping someone make a profit ... and it is the NSF's belief that the scientific community is better served by its own professional societies than by private industry'". IIA members "argue that member firms must be as aware as the professional societies of the requirements of the scientific community and even more responsive to its needs if they hope to stay in business. Making a project 'requires a greater degree of perceptivity and sensitivity to your audience'".

VII SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE

1. Grubel, H.G., "The Reduction of the Brain Drain: Problems and Policies", Minerva, Summer 1968, pp. 541-558.

   Specific problems and needed policies for the reduction of the brain drain are discussed. Establishing policies to reduce the brain drain is complicated by the difficulty in estimating and defining the number and type of migrants constituting a drain and evaluating the economic and social effects of an emigrant's departure on the remaining population. The author summarizes his discussion of problems and policies as follows: "Policies which attempt to do so by narrowing income and opportunity gaps among nations are universally desirable on many grounds ... Their disadvantage lies exclusively in the long period required for them to become effective. Policies designed to make migration more difficult ... appear to be unrealistic from a political point of view. They are also likely to result in inefficiencies, and to involve very high costs of administration and the loss of personal freedom. The proposal for the institution of intergovernmental compensation schemes for the repayment of educational subsidies invested in the emigrants by the losing country appears to have the greatest merits and least social cost. Its long-term beneficial effects may be very great ... and it can be put into effect with a minimum of administrative effort ... On the other hand, the social cost of making migration and foreign study more difficult or less rewarding appears to be greater than the social benefits to be gained by the cure of the brain drain".

2. "Re-draining the Brains: Does Britain Want Her Emigrants Back?", Science Journal, v. 5, no. 1, January 1969, pp. 13,15.

   A recently announced "drive to attract British and American engineers, managers and scientists from the USA to work for British companies" is discussed. "The 'brain drain' has been plugged temporarily because the new United States immigration laws introduced in July 1968 effectively prevent further immigration from Britain for three years". Therefore, British employers have an unusually large supply of graduates from which to choose and so most are not inclined to go to the expense of recruiting in North America. Several agencies are making efforts to recruit and supply information about available jobs. These include: (1) North American Joint Recruiting Board which represents the Civil Service Commission -- it finds jobs for 50 to 60 physical scientists and engineers a year out of 250 or so applicants; (2) Management Selection Limited (MSL), circulates potential British employers with details of would-be returners and considers part of their task as "softening up industry to make it more sympathetic to recruiting from the States"; (3) Scientific Appointments Board (SAB), an organization set up by five scientific institutes, can do no more than put applicants and employers in touch; (4) the Science Research Council has implemented a "bringback" scheme of one year research fellowships which helps people coming back and puts "money in their pockets". "Channels do at least exist for scientists to return to Britain but although the loss of engineers is more serious ... efforts to bring them back are half-hearted".

3. "The Technological Gap in the Electronics Industry and Its Causes", OECD Observer, no. 37, December 1968, pp. 40-44.

   This article is one of a series of reports by the OECD Directorate for Scientific Affairs on the technological gaps between OECD member nations. The widest gap was found to exist between the U.S. and other member countries, although "the information shows that each country has certain specific aptitudes": Japan, passive components; the Netherlands and the U.K., power tubes; and Germany, receiving tubes. Special attention was focused on semiconductors, which constitute a key branch of the electronics industry and where one country, the United States, is far in the lead. Among other things OECD found that "most new inventions and technological advances stem from a small number of US firms" and that "the US firms' share of world exports is steadily increasing". Possible factors influencing the disparities are (1) "ability or inability to judge demand correctly" and "exploiting newly acquired technologies", (2) efficiency of management and feedback of technological information, (3) government support at the R&D level and at the market level, and (4) the significant influence of the economic environment on productivity and profits.

4. "NAS Reorganizes Unit Concerned with Science and International Development", News Report, v. 19, no. 1, January 1969, p. 6.

   "The evolving character of the National Academy of Sciences' relations with developing countries and the increasingly diverse functions it is called up to perform have led the Office of the Foreign Secretary to rename and restructure its Science Organization Development Board. The Board was established under contract with AID in 1966 to create with scientists and engineers of developing countries means for a mutual approach for applying science and technology to problems of economic and social modernization. The new Board on Science and Technology for International Development will incorporate the functions of the former Latin

America and Africa Science Boards through special panels concerned with regional development problems in Latin America, Africa and Asia ... The new Board will continue to organize workshops and study groups concerned with strengthening scientific, technological, and research institutions and capabilities in developing countries". Members of the new board are identified.

5. "Fourth U.S.-Japan Conference on Natural Resources", International Science Notes, no. 21, January 1969, pp. 2-3.

"The Fourth Meeting of the United States-Japan Conference on Natural Resources (UJNR) was held in Washington, October 22-24, 1968. The UJNR is the second of a trilogy of scientific agreements between the U.S. and Japan". Reports were presented by the U.S. Panel Chairmen on the following topics: air pollution control, water pollution control, desalting energy, wind and seismic effects, undersea technology, protein resources, forage crop seeds, toxic micro-organisms, mycoplasmosis, and national parks. "An innovation was the authorization of a major committee on Marine Engineering, to include three new panels on submarine instrumentation, marine facilities, and special techniques for communication and remote control". "It was agreed that cooperation in marine environmental observation and forecasting and in marine geology and seabottom surveys should be further developed ..." "The Conference approved expansion into other new areas by authorizing the establishment of a Panel on Forestry to include work on resource surveys, inventory, protection, mechanization, conservation, and reforestation. The next conference is tentatively scheduled for spring of 1970 in Japan".

6. "Australia Asks U.S. Aid in Atomic Excavation", Science, v. 163, no. 3861, 31 January 1969, p. 459.

"The U.S. government has indicated that it will act on an Australian request that the U.S. Atomic Energy Commission (AEC) be authorized to participate in a study of the possible use of nuclear explosives to build a harbor at Cape Keraudren, in northwestern Australia. The Australian government wants the U.S. to contribute nuclear material and technical knowledge; they plan to use the port for export of vast iron ore deposits in the undeveloped area. The U.S. participation in the project could give rise to some problems concerning the Nuclear Test Ban Treaty, which prohibits any nation from releasing nuclear particles into the atmosphere outside its own territory".

7. "Vietnam Herbicide Study Planned", Science News, v. 95, no. 3, 18 January 1969, p. 71.

The American Association for the Advancement of Science (AAAS) has "resolved to study the long-term effects of the military defoliation program in Vietnam, but deliberately avoided any mention of Vietnam by name in its resolution. Herbicides have been used heavily ... in South Vietnam, in addition to the demilitarized zone, and scientists expect that such widespread spraying will have long-term consequences on the country's ecology ..." "The AAAS board members have widely varying opinions on the defoliation program. A minority believes it could possibly have beneficial results in clearing the jungle, except for the fact that arsenic compounds, principally cacodylic acid, which are being used, might be converted in the soil to other, highly toxic, arsenic compounds. Others view the possibility of benefits as vanishingly small". The actual study planned by the AAAS is not likely to begin until hostilities cease.

VIII SCIENCE POLICY IN FOREIGN COUNTRIES

International

1. Ziman, J.M., "Growth and Spread of Science", Nature, v. 221, no. 5180, 8 February 1969, pp. 521-524.

   This article, which is an abridged version of a Royal Society Rutherford Memorial Lecture delivered in December 1968, discusses the need for basic research in developing nations and the policies for its growth and diffusion. The author begins with a discussion of some reasons why a "certain amount of fundamental research must be sponsored in a developing country". This is followed by a discussion of factors to be considered in selecting areas of research, and the need for universities to engage in applied research. With respect to higher education, the author stresses the need for institutes of technology for "the training of practical engineers" and graduate-level universities for training research scientists. He warns that science in a developing nation "cannot cut itself off from competition" and that if "it is to be genuine science at all, it must, from the beginning, be able to stand on its own feet". As for policy, the "optimum strategy for the organization and planning of pure scientific research ... would ... seem to be to concentrate on a few solid scientific problems ... and to establish a sound reputation for good if unspectacular work in these particular fields".

2. "Council of Europe Scientific Co-operation", SSF Newsletter, v. 4, no. 1, December 1968, p. 7.

   "British Labor MP Robert Maxwell introduced a report on problems of European Cooperation in scientific research and technology" to the Council of Europe Assembly and the European Parliament on 27 September. Maxwell said the main task "was to exploit the very large investments which had been made by Europe in science and technology in the last few years ... Unless European governments quickly standardize their procurement practices and cut out wasteful duplication in research ... European firms could lose orders for some $25,000 million" for civil and military equipment "which European governments are due to place over the next two years ... The European policymaker is bound to admit that the existing system of cooperation not only runs out of control, but is to a large extent counter-productive

... As a possible solution, Mr. Maxwell suggests bringing all existing organizations under the umbrella of a Council with a wide field of competence".

3. "European Cooperation", Nature, v. 220, no. 5174, 28 December 1968, p. 1268.

   "The deadlock between France and the Netherlands on the question of technological collaboration between the Common Market and other countries was resolved at a meeting of the Council of Ministers of the European Community when a compromise procedure for associating with other countries was hammered out. The deadlock arose after the last French veto on British entry into the Common Market. The Dutch boycotted the Community's Marechal Committee on technological cooperation, saying that it should be allowed to consider collaboration with countries that had applied for community membership. The French position was that only the member countries should be involved. The way the compromise works is that the Marechal Committee will resume its interrupted study of the possible fields for international cooperation and will report to the council by March of next year. The ministers will consider the report and may at that stage make proposals to other 'interested' European countries." "The Marechal Committee will initially consider collaboration in seven fields -- automatic data processing, telecommunications, development of new forms of transport, oceanography, metallurgy, meteorology and nuisances (including air and water pollution). Whether the fact that none of these areas is politically controversial will make agreement easy and pave the way for more significant cooperation remains to be seen".

4. Greenberg, D.S., "Euratom: Atomic Agency Foundering Amidst Squabbles of Its Partners", Science, v. 163, no. 3867, 7 February 1969, pp. 552-553.

   The past, present, and prospects of Euratom -- the Common Market agency for developing atomic energy -- are reviewed and analyzed. "Today, despite enormous research and development expenditures through Euratom and individually among the six European Community nations, Europe trails the United States by far in this booming and increasingly lucrative field of technology". Euratom "is a declining, dispirited organization, operating on sharply cut, makeshift budgets, while its sponsors wrangle over programs and costs and deal sharply on the question of common interest versus opportunities to turn a national profit". Although the Common Market countries are spending about as much as the U.S. in developing nuclear power, and although both have approximately the same number of plants in operation, the U.S. "is now building or planning 87 units, while the figure for the Common Market is only 16". The troubles that have beset Euratom, and continue to be with it, are cited, with the conclusion that "political cohesion has shown itself to be a prerequisite for a massive technological effort, rather than a product of it". As for the future, there is growing support for launching new cooperative programs in science and technology, such as data processing, telecommunication, and oceanography.

5. "Community with Nine Lives", Nature, v. 221, no. 5175, 4 January 1969, p. 3.

"Euratom, the Common Market's nuclear community, has survived its latest crisis". The crisis was caused principally by France, "which has been trying to turn the work of the community to its own advantage". However, agreement was reached on a budget of $48 million for 1969; "about half this budget could be spent on joint Euratom projects in which all countries combine, and the other half on 'complementary' programmes, which are subscribed to by only those countries which declare an interest". "The agreement does represent a compromise by France, and it brings another six months of job security to the staff of Euratom. If the original French plan had been adopted, the research staff, 2700 strong would have been severely pruned ... Frances's original proposal that there should be no community research work at all would have meant a reduction by two-thirds in the numbers employed". The Commission officials are hoping "to shift the emphasis in Euratom away from nuclear work towards other important industries, like metallurgy and computers. If this ploy works, the programme could perhaps be coordinated with the limited amount of technological cooperation which has been agreed between the six and other countries, including Britain".

6. "ELDO Through the Looking Glass", Nature, v. 221, no. 5175, 4 January 1969, p. 8.

"On December 19 and 20 in Paris, the ELDO Council had its last chance to agree to the 1969 Budget. Agreement was threatened by two possibilities: first, that Britain would insist on its proposal, made at the Bonn European Space Conference ... to make a substantial increase in support of European space relating to applications satellites dependent on being released from its two years' financial obligation to ELDO; and second, that the hard-won but not unanimous accommodation reached by the five continental ELDO ministers in November" would be punctured by Italy's refusal of support when it comes up for the vote. Neither of these upsets took place ... but ELDO will, nevertheless, enter 1969 without a budget, with small prospect of obtaining one for some time ..." "[T]he British government ... declared itself prepared to help its continental partners towards their launcher aspirations by providing a £10 million subsidy for ELDO's 1969 budget. It was made clear that no further money would be forthcoming from Britain after 1969". "The paradoxical question left at the end of the year is that Britain wishes to get shot of ELDO and is unconvinced by the arguments for an independent European launcher capability, is the only ELDO member prepared to support next years budget".

7. "ELDO Facing Greatest Budget Crisis", Aviation Week & Space Technology, v. 90, no. 5, 3 February 1969, p. 21.

"European Launcher Development Organization (ELDO), operating on a contingency funding basis since Dec. 31 when Britain and Italy rejected a compromise budget for the final two years of the program, is facing what may be its greatest budgetary crisis". "The latest of ELDO's money crises was prompted by Britain's refusal to approve a compromise budget of $562 million for a reduced program for the development of the Europa 1 launcher". "The British representatives last fall had accepted them subject to approval by the new government then being formed in Italy". "The new Italian government subsequently rejected the new program, and Italian officials now say their country wants to withdraw from both ELDO and the European Space Research Organization (ESRO), which handles spacecraft development". "In their objections to the revised budget considered at the December meeting, British delegates said it constituted a new program not covered by the original treaty. Britain's share of the compromise budget for the remainder of the program was set at $40 million, but the British said they wanted to contribute only $24 million of this to completing the Europa 1 project and divert the remaining $16 million to the development of scientific and applications satellites with ESRO".

8. Croome, A., "ESRO: The Next Decade", New Scientist, v. 40, no. 628, 19 December 1968, pp. 662-663.

"Last month at the European Space Conference in Bonn Mr. Wedgewood Benn proposed a deal in which the UK would trade greater participation in an enlarged applications satellite programme in exchange for release from its remaining commitment to ELDO. Does this mean a useful lease of new life for ESRO?" This article reviews recent activities of ESRO, its programme for the immediate future, its financial problems, and Benn's proposal. The UK proposal, which "went through", amounts to a major European long-term effort on so-called information-transfer satellites, seen as a developing tool for a range of practical purposes requiring rapid data exchange. These include TV relay, weather data handling, air and sea traffic control, and resource surveying -- arranged in order of European interest today". "There is no doubt that most of the Space Conference members are keen to get into application satellites. It is less clear that they accept the second part of Mr. Benn's proposition: that Europe can do without its own launcher and rely on the Americans".

9. "EMBO Accord Signed", Science, v. 163, no. 3870, 28 February 1969, p. 914.

"The European Molecular Biology Organization (EMBO), which until now has been an organization of distinguished individual biologists, now seems assured of support from Western European governments. An intergovernmental agreement was signed this month near Geneva by Austria, Denmark, Germany, France, Greece, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom. This agreement, when ratified, will provide for contributions from member countries for training, teaching, and research scholarships; also exchange programs, courses, and study meetings in biology".

10. "'European MIT' Plan is Crumbling", Scientific Research, v. 4, no. 4, 17 February 1969, pp. 15-16.

The proposed $250-million International Technological Institute, which was to help close the "technology gap", appears to be "falling apart". The Institute, proposed by OECD, has been in the study and discussion stage for two years. "It was to have been financed by governments and private industry and be established this year in Italy or The Netherlands. Britain, Germany, France, Belgium, Italy, and Holland have been observers". The "Institute's promised governmental aid had reached only $100,000 by the end of 1968 and France decided to back out. She reduced her status on the OECD study committee from participant to observer, largely because the Institute had become a luxury she could no longer afford". "Now Belgium is withdrawing from the study committee on budgetary grounds, and representatives of the West German government have told the committee they aren't sure of financial support from German industry. The plan for the Institute is not dead yet -- its three remaining backers are still interested -- but the chances of its becoming reality are very slim, OECD officials say".

11. "USSR, France O.K. Biomedical Pact", Scientific Research, v. 4, no. 3, 3 February 1969, p. 21.

"France and the Soviet Union have laid the groundwork for substantial collaboration in biomedical research. An agreement signed here last month by the two countries calls for joint work in virology, cardiology, cancer research, and artificial organ development. The agreement, which the French delayed for several months in reaction to the Soviet invasion of Czechoslovakia, authorizes an exchange of 25 scientists from each country. The two countries are already cooperating in high-energy physics research at the Serpukhov accelerator. France's Institut Pasteur and the Soviet Medical Academy will soon sign a general agreement of cooperation, leading the way for other institutions. The first of several bi-national study groups will soon begin exploring computer applications in medical research".

12. "More for Educational Research", Nature, v. 221, no. 5175, 4 January 1969, p. 9.

> "The Royal Dutch Shell Group of companies has given the Organization for Economic Cooperation and Development another $0.75 million for its centre for Educational Research and Innovation in Paris. The centre was launched in the middle of last year with a grant of $1 million from the Ford Foundation, and its purpose is to provide a background for major educational reforms in OECD member countries. The main priorities of the programme are developing educational programmes for underprivileged ('socially disadvantaged') groups, curriculum development for secondary schools and universities, and the development of new teaching methods. The centre combines general studies and joint projects between the centre and individual OECD countries. The OECD says that the new grant will enable the centre to intensify its work in the areas which seem most pressing".

Austria

13. "Priority Programme for Research", Science Policy Information, no. 5, Organization for Economic Cooperation and Development (OECD), November 1968, p. 11.

> "The percentage of Austrian gross national product to be spent on R&D is to be increased from its present 0.6 per cent to 1 per cent, and in a long-term programme to 1.5 - 2 per cent. To achieve this within 10 years, R&D expenditure must rise 20 per cent faster per year than the gross national product in current prices. This is pointed out in the Report on Research which the Federal Government recently submitted to the Austrian Research Council for comment. The most urgent measures to be taken, it states, are a continuing increase in government subsidies for research, improved fiscal legislation, and the creation of a favourable 'research climate'. A priority programme drawn up by the Federal Government will provide support for those fundamental research projects which are of an interdisciplinary nature and likely

to have repercussions on applied research and development". Applied research priorities include development of scientific instruments and chemical and pharmaceutical products, and support for industrial R&D that may "make Austria more competitve in the international market".

14. "Academy of Sciences Creates New Research Institutes", Science Policy Information, no. 5, Organization for Economic Cooperation and Development (OECD), November 1968, p. 12.

"In his annual report to the Austrian Academy of Sciences, its President, Professor Erich Schmid, pointed out that for the first time the academy had actually set up new research institutes, i.e. on high energy physics and molecular biology. Moreover, the biological research station in Wilhelminenberg had been taken over by the Academy as an Institute for Comparative Behavioural Sciences. Future plans included the creation of an institute for data processing using large computers, an institute for brain research, and the expansion and transformation of the biological research station at Lunz into an Academy Institute for Limnology. The Academy's income, nearly all of which was provided by the Federal Government, amounted to A.Sch. 21 million in 1968, compared with A.Sch. 11 million in 1967".

15. "The Fund for the Promotion of Research in Industry", Science Policy Information, no. 5, Organization for Economic Cooperation and Development (OECD), November 1968, pp. 13-14.

"The first report of the [Austrian] Fund for the Promotion of Research in Industry, which was submitted to the Minister of Commerce and Industry in February 1968, dealt with the state of industrial research in 1966, requirements for 1969 and included long-term forecasts. The authors of the report request a government subsidy of A.Sch. 340 million for 1969, compared with A.Sch. 225 million in 1968. 47 per cent of this increase should be allocated to research within firms, 44 per cent to co-operative research and 9 per cent to other kinds of industrial research. A request is also made for fiscal legislation which would encourage research. The Fund considers that by 1975 at the latest, expenditure for industrial research in Austria should reach the same level as in the Netherlands, Sweden or Switzerland where it amounts to 1 per cent of gross national product. This means that as from 1969 it must expand by 25 per cent per year".

Brazil

16. "Brazil Straitjackets Foreign Research", Scientific Research, v. 4, no. 4, 17 February 1969, p. 15.

"Brazil's military regime is expected this month to issue a decree making international research in that country all but impossible. Frustrating restrictions on oceanographic research are already in existence, imposed last summer by Brazilian naval intelligence, which took over from the Brazilian National Research Council the handling of all foreign requests for permission to conduct oceanographic research". "Behind the restrictive regulations lies a growing ultranationalism and a feeling that foreign researchers have in the past been cavalier in their attitude toward Brazil. There is also a fear that foreign research teams will try to hoodwink Brazil into letting them search the ocean floor or the hinterland and then make off with priceless data on natural resources such as mineral deposits". The new decree is expected to impose on landbased foreign research an equivalent of the procedures required for oceanographic research. "Although the new decree may prevent the start of any new foreign research either on land or at sea, it will not affect cooperative projects already underway".

17. "Brazil to Tackle Illiteracy by Satellite", Science Journal, v. 4, no. 12, December 1968, p. 9.

The United Nations is supporting a plan to combat illiteracy in Brazil by using an artificial satellite for educational television. "Programmes will include basic instructions in Portuguese, hygiene and agriculture. Preliminary tests will be made next year using the existing ATS-3 satellite in geo-stationary orbit over Brazil. Forty engineers of the Comissao Nacional de Actividades Espaciais (CNAE), the space agency in Sao Paulo, will take part in post-graduate courses using the satellite to obtain daily contact with Stanford University". "More ambitious experiments are planned for 1971-72 by which time new ATS satellites will have been launched". It has been proposed that 500 television receivers be installed in the small cities of the Brazilian northwest, where illiteracy is around 70 percent. "An agreement already signed between NASA and CNAE permits use of the ATS for nine months in daily lessons for 15,000 people". "The next stage ... will be for Brazil to acquire her own educational satellite called SACI (Satellite Avancado de Communicacoes Interdisiplinares)". "It will enable about 1.8 million pupils to attend lessons relayed from space every day using 152,000 TV sets partly subscribed by the United Nations. Cost of the satellite system, including the launcher, is put at around one thousand million new cruzeiros ($300 million)".

Canada

18. "Towards a National Science Policy for Canada", Science Council of Canada, Report No. 4, October 1968, 56 pp.

This report lays down "broad guidelines for the future use and development of science and technology in Canada". "The recommendations made represent the first steps toward the formulation of a comprehensive national science policy and pay particular attention to the role which mission-oriented programs can play in shaping the growth of Canadian science". (The report does not deal with basic research and "little science"). The report starts with a statement of national goals as the framework for its policy recommendations, reviews R&D funding trends, discusses the organization of science and federal support programs, presents specific areas for action, and generally discusses manpower and monetary resources. Major recommendations made include: a larger share of Canadian R&D should be performed by universities and industry, rather than by government laboratories; "comprehensive, mission-oriented 'major programs' be set up to coordinate the efforts of all sectors of the economy and to bring a multi-disciplinary approach to the solution of important national problems"; nuclear power, space, and water resources programs should receive continuing support. In addition to these areas, the Science Council "is establishing task forces to prepare detailed plans for major programs in ... Transportation, Urban Development, Computer Applications, and Scientific and Technical Aid to Developing Areas".

(The report can be obtained by mail from the Queen's Printer, Ottawa, for 75 cents)

19. "Proceedings of the Special Committee on Science Policy", The Senate of Canada, First Session, Twenty-eighth Parliament, 1968, No. 2 (October 1968), Nos. 9,10,11 (November 1968), Queen's Printer and Controller of Stationery, Ottawa, Canada, 1968.

These documents present hearings held by a special committee of the Canadian Senate which was formed to study Canada's science policy. The objective of the committee is "to consider and report upon the scientific policy of the Federal Government with the objective of appraising its priorities, its budget, and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age". Specific topics of inquiry are as follows: trends in R&D expenditures; R&D activities carried out in the physical, life, and human sciences; the pattern of federal assistance in these fields; and "the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient scientific policy for Canada".

20. "Canadian Science Policy: Nonexistent", Scientific Research, v. 4, no. 1, 6 January 1969, p. 15.

"With the end last month of the second phase of the Canadian Senate's inquiry into national science policy, it has become obvious that Canada has no cohesive science policy. Nor is it clear what roles industry, government, and universities should play in Canadian science. Sen. Maurice Lamontagne of the Canadian Senate, concerned over the lack of a forum for discussion of Canadian science policy, initiated the multi-stage inquiry early this year". "During the most recent hearings the National Research Council (a crown agency that disburses r&d funds to universities) warned the Senate committee that 'our present industrial climate, structure, and resources are not sufficiently favorable to induce industry to undertake major long-range r&d programs'". "The Federal Cabinet, from the Prime Minister to the head of the Treasury Board, has accepted the argument that government support of scientific and industrial research is too heavily weighted in the direction of basic science, and that there is too much government spending on r&d and not enough by industry. However, Ottawa's support of science in universities -- which next year is slated to rise again by a third to $100 million -- is still viewed as untouchable, and budget-paring will be aimed at research activities of government departments and crown agencies. The National Research Council, long the bulwark of pure science in Canada, has come around to the position that it must now greatly intensify its efforts in applied and industrial research. The science Council, too, has concurred with the growing consensus that the emphasis should be put on applied research".

China

21. Oldham, C.H., "Science Travels the Mao Road", Bulletin of the Atomic Scientists, v. 25, no. 2, February 1969, pp. 80-83.

Some of China's major science policy issues are discussed and the impact of the "Cultural Revolution" on science and technology is assessed. The policy issues, polarized around the Mao Tse-tung and Liu Shao-chi supporters, include the question of research priorities, "the way science should be used to meet national goals", "the choice of technology in agriculture", and the aims and programs of higher education. The Liu group has been accused of favoring theoretical research divorced from the needs of the country and of "restoring what was ancient and worshipping what was foreign". This group also opposed building the atomic bomb on the grounds that "it would be a waste of China's resources". Although both groups favored agricultural mechanization, Liu supporters favored concentration of resources for efficiency while the Mao group preferred a great degree of diffusion, for social and political reasons. "But the sharpest ... differences between Mao and Liu have been centered on the educational policies": the latter emphasizes scientific and technical education while the former follows "an alternating policy of greater and then less emphasis on political and ideological education". "It is clear that scientific institutions and scientists have been caught up in the turmoil and confusion which characterize China today". In spite of continued isolated achievements, the author believes the Cultural Revolution has slowed China's aim "to catch up with the advanced countries in 20 to 30 years", but "the new policies will probably result in a greater concentration of scientific relevance to China's development needs".

France

22. "The 1969 Budget Proposals for Scientific Research", Science Policy Information, no. 5, Organization for Economic Cooperation and Development (OECD), November 1968, pp. 23-24.

"Civil research in France is divided into three big chapters: Atomic energy ... space ... and the "research block vote" ... including the Centre National de la Recherche Scientifique and medical and agricultural research". The 1969 budget for atomic energy amounts to Frs. 2,058 million compared with Frs. 2,040 in 1968. "In view of price increases and higher salaries this means a net reduction in investment possibilities". Space expenditures have been reduced from Frs. 596 million in 1968 to Frs. 467 million in 1969; no funds have been provided for E.L.D.O., which is already experiencing difficulties. Appropriations for the research block vote are reduced "from Frs. 700 million in 1968 to Frs. 650 million in 1969. The reductions affect all sectors with the exception of the new National Centre for the Exploitation of the Oceans (C.N.E.X.O.) which receives Frs. 41 million (1968: Frs. 35 million), the special credits for the 'plan calcul' (the French Government plan for a national computer industry) amounting to Frs. 180 million (1968: Frs. 145 million), and aid for the development of research results, w ich is intended to promote applied research and receives Frs. 175 million (1968: Frs. 150 million)".

23. Greenberg, D.S., "French Science: Austerity Drive Ends Rapid Budget Growth", Science, v. 163, no. 3864, 17 January 1969, pp. 266-267.

Despite the franc crisis and the resulting austerity program for support of French science and technology, "the current situation ... is not regarded as calamitous". "The French government is now providing about $1.7 billion a year for research and development; this amount, plus another $800 million spent by industry, brings French R&D expenditures to approximately 2.4 percent of the gross national product, compared with 1.5 percent as recently as 1962". The growth in research in recent years has been phenomenal, "with major components of the science budget rising by as much as 35 percent between 1966 and 1967, and 24 percent between 1967 and 1968 -- as measured in actual purchasing power. In the new year ... the increase ... will be slightly below 4 percent for most areas, but with costs still going up, including a 12-percent salary increase ... the total fund for the actual conduct of research is remaining constant, and, in reality, may turn out to be somewhat less than before". Although the government has committed itself to a period of austerity, it still holds to "its design of at least some involvement in every significant field of research". However, several reductions in expenditures have resulted: $12 million reduction in the amount originally planned to spend on the Anglo-French Concorde supersonic transport project; $80 million reduction in military expenditures; reductions in mathematics, physics, chemistry, etc., range from 10 to 50 percent.

Germany

24. "Federal Budget Proposals for 1969: Increased Support for Science and Research", Science Policy Information, no. 5, Organization for Economic Cooperation and Development (OECD), November 1968, p. 32.

In 1969, Germany plans "to spend DM 2,179 million on the promotion of science and research, or about DM 257 million (13.4 per cent) more than in the current budget year. Expenditure on general scientific research will increase by DM 149 million to DM 1,037 million. Of this, Federal subsidies for University expansion alone account for DM 730 million, an increase of DM 100 million. There are also considerable increases in subsidies to the German Research Association and the Max Planck Society, and for Special Research Areas the establishment of regional computer centres, applied research and oceanography. Amounts allocated to nuclear research and technology go up by DM 728 million. Expenditure on space and aviation research under the medium-term programme for the promotion of space research is to be increased by DM 45 million to DM 370 million. Sums amounting to about DM 70 million are provided for data processing and new techniques. Of this, DM 48 million (DM 34 million in the previous year) is for the promotion of R&D on data processing in the public sector and about DM 12 million for Federal support for the newly-founded Limited Company for Mathematics and Data Processing". Present plans call for further steep increases in expenditures for science and research (DM 2,660 million in 1970, DM 3,400 million in 1971, and DM 4,000 million in 1972).

25. "Germany Tries New Research System", Scientific Research, v. 4, no. 1, 6 January 1969, p. 18.

A new system for research grants has been initiated by West Germany's Science Council to encourage cooperation between scientists at different institutions and to reduce duplicative research. Under the new system, certain universities are given prime responsibility for selected areas of research, "usually as manager of a group effort". The present program allots nearly $1 million to some 64 research areas; by the early '70's, funding is expected to rise to $50 million per year. "Previously existing government funds for university research will not be cut; they will continue to be distributed as institutional grants without earmarking by subject". "Although the program appears to reward individual performance, it actually emphasizes research cooperation -- between scientists and scientific institutions". "In selecting and supporting one school to work in a highly specialized field, the Science Council is not trying to force other schools to stop offering the same subject. But, in the long run, the program could have that effect".

26. "Problems of Responsibility", Nature, v. 221, no. 5175, 4 January 1969, p. 10.

Recently the West German branch of the international Society for Social Responsibility in Science held a conference entitled "Human Society in the view of Science". "The aim was to discuss how scientists and technologists can contribute to the development of a healthy policy concerning the future of human society". Some of the topics covered included: a need for "an increasing democratization of the universities, allowing the students to take an active part in reform of teaching and the choice of subjects of research"; "the most important task of the responsible scientist" is "adherence to the strict ethical code of pure research which could serve as an example for a new ethics in politics; modern society is increasingly dominated by science and technology, and her problems can be solved only by planning on scientific principles"; the "danger to man arising out of the irresponsible contamination of the biosphere"; problems of medicine, genetics and psychology in modern society. Other topics included: "problems of overpopulation, genetic damage due to modern ways of life and the use of drugs, and the fact that serious disturbances in the social behavior of adolescents and adults ... can be induced by failure in the normal close relationship between mother and child in very early life".

27. "New Serial Publication on Research Policy", Science Policy Information, no. 5, Organization for Economic Cooperation and Development (OECD), November 1968, p. 44.

"The Ministry for Scientific Research is publishing a new series Forschungspolitik (Research Policy). The first six numbers deal with future tasks for research and development on questions such as feeding the world, sources of energy, soil sciences, space research, biology, environmental science, social aspects of future research policy. These subjects are treated by independent experts expressing their personal opinions".

(Available from Gersbach and Sohn Verlag, 8000 Munich 34, Barerstr. 32, Price DM 2,00).

Hungary

28. Kenton, J.E., "Physics and Chemistry in Hungary -- Vigor and Ingenuity", Scientific Research, v. 3, no. 26, 23 December 1968, pp. 27-29.

The author examines the present state of scientific vigor in Hungary, whose small size and population did not prevent it from producing "an extraordinary number of outstanding scientists in the second quarter of this century". "Two of the most energetically supported sciences of the postwar years [in Hungary] have been medicine ... and physics". "Both areas come under the control of the Hungarian Academy of Sciences in 1949, after its reor anization following the Soviet occupation of the country". The Academy organized itself to "supply the scale of governmental support needed for progress in this age of big science. The Central Physics Research Institute was founded in 1950; the Experimental Research Institute for Medical Science in 1952. Chemical research, ... is neither as centralized nor as large scale as physics and medicine". The scope of the Physics Institute is broad: solid-state, physical optics, high-energy, and nuclear physics, nuclear chemistry, and reactor physics and electronics. The "dominant facility ... is a 2 Mwth water-cooled research reactor" started up in 1959 and modified in 1967 to greatly extend its capabilities. The

Institute is also "active in design of computers and auxiliary equipment". The Institute's Annual operating budget is about $3.5 million: the total staff of 1,300 includes more than 250 scientists and engineers.

Israel

29. "Science and Technology in Israel", International Science Notes, no. 21, January 1969, pp. 5-9.

The current status and plans for science and technology in Israel are described with respect to such factors as manpower, technical education, basic and applied research, and the role of government and other institutions. Israel is reported to have 10,000 degree-holding engineers and 14,000 scientists; about 2.5 percent of its 900,000 labor force are scientists and engineers. However, it is believed that universities must turn out substantially more technical manpower if Israel is to meet its goals in the 1970's. In science, Israel excels in chemistry, biology, physics and mathematics, while current technology is strongest in agriculture, water utilization and conservation, food processing, and chemical production. More emphasis is now being given to electronics technology, computer technology, and aircraft manufacture. Since 1967, the government "has taken steps to have the Israeli scientific community devote more of its research time and efforts to applied science with a view to develop new industries, preferably science-based industries, which might tap a growing world export market". At present, there is a general shortage of applied scientists and engineers to meet these goals; actions being taken by existing institutions to cope with this shortage, as well as the creation of new educational centers, are cited.

Italy

30. "Italy Affected by Brain Drain", Science Policy Information, no. 5, Organization for Economic Cooperation and Development (OECD), November 1968, p. 48.

"According to a recent, though not official estimate, Italy has lost some 8,000 research scientists to other countries, principally the United States, in the past 20 years. Although these losses are lower than those suffered, for instance, by the United Kingdom (4,000 between 1958 and 1962) their effect is likely to be far more serious since the Italian research establishment as a whole is proportionately much smaller. In its recent annual report to the Government the National Research Council estimated that public and private research spending and funds earmarked for European Community research, such as that performed for Euratom, amounted to 263,476 million lire ($150 million) last year. This expenditure is only 0.7 per cent of Italy's total national income". "The report warned that unless the Government increased its expenditures on at least applied research, not to mention pure research, the country would find itself totally dependent on North European and American technology. A document prepared by the Italian Confederation of Research ... concluded that unless there was "decisive (Government) intervention ... the nation's principal research organisations would be almost completely emptied of their best persons". If the drain continued, the State would not even be able to maintain its own technical standards.

Japan

31. "The Effect of Science and Technology on Economy and Society", Science Policy Information, no. 5, Organization for Economic Cooperation and Development (OECD), November 1968, pp. 50-51.

The Science and Technology Agency of Japan has published an English summary of the White Paper on Science and Technology which deals with "the effect of science and technology on economy and society". Its chapters cover: Government Policy Measures; Trends in Research Investment; Science and Technology and Manpower Resources; Scientific and Technical Information; International Co-operation; Science and Technology and Industry; Science and Technology and National Life; Policy Trends in Leading Countries. According to the report, "the average annual growth rate of labour productivity in manufacturing industries has reached 9.4 per cent of which technological improvement is estimated to account for 4.1 per cent". Technology gaps are said to exist in certain research intensive industries such as electronics, and in research connected with some aspects of public welfare. The report calls for a substantial increase in R&D investment. "Japan's overall research investment including that of the private sector amounted to 488.7 thousand million yen in 1966, or 1.7 per cent of the national income". "The target of the Economic and Social Development Plan, which was approved by the Government in March 1967, is to raise this proportion to 2.5 per cent or 1,230 million yen per year in value terms by 1971". National budget allocations for science and technology will increase from 144.8 thousand million yen in 1966 to 167.9 thousand million yen in 1967, which is 3.4 per cent of the overall budget. This is 30 per cent of the overall research investment".

32. "Japan's Space Hopes Glimmer", Industrial Research, v. 11, no. 1, January 1969, p. 31.

The present status of Japan's space program is discussed. "Japanese space scientists have just about everything they need except the guidance system" to join the "ultra-exclusive space club". Cooperation for the guidance system is being held up by the U.S. State Department "pending firmer assurances from the Japanese that they will guard the technology and prevent it from being used for military purposes". Since Japan has no official secrets act "American technological contributions will be limited to vehicles no bigger than sounding rockets. "Japan's current plans call for three satellite launchings: a test satellite during Japan's fiscal year 1970 (April 1, 1970 to March 31, 1971); a medium altitude communications satellite the following fiscal year; and a synchronous-orbit communications satellite to serve the entire nation by fiscal 1973. The U.S. is willing to launch these satellites for Japan (as it has for Canada, Britain, Italy and Australia), but the Japanese want to use their own booster. Only the U.S., the Soviet Union and France have done this. In addition to the lack of an adequate guidance system, the Japanese also face organizational and funding problems. A new space council is being formed to bring together the Science and Technology Agency and the University of Tokyo, which pioneered space research in Japan. Last year's 'total' space budget was $20.5-million, less than the cost of a single American Atlas-Centaur launch vehicle".

33. "Japan to Cut Down 40-GeV?", Scientific Research, v. 4, no. 2, 20 January 1969, p. 19.

"Japan's proposed 40-GeV proton synchrotron may be cut back to 5-10 GeV, and an affiliated elementary-particle research institute slashed to about one-fourth its planned size. The reductions were recommended ... by the Scientific Affairs Council (SAC), a key Japanese government advisory group". "The Council proposed that only $21 million of the requested $83.3 million be allocated for the program because, according to SAC Chairman Seiichi Kaya, scientists in other fields had complained that appropriating $83.3 million for the institute would leave very little for projects in their disciplines. The belief is also widespread that a 40-GeV machine could not compete with the existing 76-GeV Serpukhov accelerator, the proposed U.S. 200-400-GeV machine, and the proposed CERN 300 GeV accelerator".

United Kingdom

34. "Britain's Science Expenditure", Nature, v. 221, no. 5177, 18 January 1969, pp. 207-208.

A recent report, Statistics of Science and Technology, shows "that universities have taken a growing share of the research and development expenditure in Britain over the past five years. The university share ... has gone up from 4-9 per cent of the total to 7.1 per cent, though there is evidence that it has now stabilized at around this figure". "Although the total research and development budget has grown rapidly, a steadily decreasing proportion of it is supplied from central government sources. The decline of the defense research budget, in particular, has had the effect of reducing the central government share from 57.5 per cent in 1961-62 to just over 50 per cent in 1966-67. During the same period, the proportion provided by private industry has increased marginally, to 39.9 per cent, but the greatest increase has been shown by overseas sponsors of British research and development". "Although the defense budget has only been holding its own, there does seem to have been a genuine switch of government resources into civil research".

35. "Europe and the Great Science Muddle", Technology Review, v. 71, no. 3, January 1969, p. 11.

"It is not good enough to insist that 'we need more scientists'. We ought to use scientists better, our training should be reorganized and rationalized from top to bottom, and the opportunities should be more realistic". The author describes the science scene in England as "stagnant", "a gloomy introspective phase of myopic indifference". "There is a common feeling in England that we have too few scientists: but the experiences of the scientists themselves belie the suggestion. They find, for instance, that rates of pay are low and that the competition for employment is very severe". "The difficulty is not one of supply and demand, but is a matter of frustrating conditions in education and beyond". "Although the graduate research scientist needs qualities such as heterodox, independence and original creativity, he is trained to become a servile, conformist memorizer of data; his creativity is stifled and the chances for original constructive research are denied him for far too long". The author feels the "'qualification gap' -- the disparity between the criteria of educational selection for a profession and the qualities needed by the graduate in practice" -- underlies much of the present discontent. The author concludes that "simply creating a vast new pool of unwanted, unappreciated specialists will only worsen an already bizarre situation".

U.S.S.R.

36. "Economic Incentive in Soviet Science", New Scientist, v. 40, no. 629, 26 December 1968, pp. 704-705.

The first experiment in using economic incentives to improve the effectiveness of Soviet scientific and technical organizations "is due to go into effect on 1 January 1969 in the research, design and technical organizations of the Ministry of Power Engineering". "According to A. Bachurin, Deputy Chairman of the USSR Planning Committee (Ekonomicheskaya Gazeta, 1968/No. 45), a special bonus system will be set up to provide incentive for technological ideas". Related to this are other proposals, still at the talking stage, for evaluating the performance of such institutes. For example, the First Deputy Chairman of The State Committee for Science and Technology, Academician Trapeznikov, says that in the future 'evaluation of research results will be done, not in terms of completed topics or published papers, but rather in terms of novelty, wealth and promise of suggested and realized scientific and technological ideas'. "This evaluation will largely determine the future of the institute -- whether it will continue to receive funds, its future research programme, or even its continued existence". In these areas, it "is clear that the Soviet government is stepping carefully"; the research organizations mentioned above are all closely tied with industry in which the measurement of research productivity "should not be two difficult".

37. "Soviet Physicists -- Race Toward the 1,000 GeV", Science News, v. 95, no. 3, 18 January 1969, pp. 63-64.

Detailed plans for a 1000-GeV accelerator have been prepared by Soviet physicists. "The Soviet Government has not yet made any public commitment to build such a machine, and it is difficult to know how seriously to take the plans". "An important new feature is what the designers call cybernetic control. An accelerator operating at 1000 GeV would be fiercely radioactive ... The Soviet design therefore includes sensors at various points, which will monitor performance and feed information to automatic controls". "Experimentally (it) would operate in the narrowest regions of particle physics ... Many theories of particle physics, including the symmetry groups that have been so much discussed, could be checked at ultrahigh energies". The machine could also be used to study modifications of current theories of space and, generally to further investigation of fundamental laws. "[A]t the moment, the Soviets are ahead in the hardware part of the competition since they are operating the world's most energetic accelerator (the 76-GeV synchrotron) at Serpukhov". The United States is building a 200 to 400 GeV machine (Batavia, Ill.), and a 300-GeV European machine is in the planning stage. "Accelerators of similar energy have been discussed by American physicists and some preliminary studies have been made ..." but "no such U.S. group is working on any such detailed plan". An AEC translation of the Soviet report is available in two volumes, AEC-tr-6936 and 6949.