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THIS 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. SCIENCE IS USED TO DENOTE ENGINEERING, TECHNOLOGY, AND SCIENCE. 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 A BIBLIOGRAPHIC, PARTIALLY-ANNOTATED LISTING OF CURRENT PUBLICATIONS IN THE AREA. PUBLICATIONS OF A HIGHLY TECHNICAL AND NARROWLY SPECIALIZED NATURE ARE EXCLUDED. THE BIBLIOGRAPHIC INFORMATION IS PRESENTED UNDER A NUMBER OF TOPICAL CATEGORIES WHICH ARE (1) GENERAL, (2) SCIENCE, DOMESTIC PROBLEMS, AND NATIONAL GOALS, (3) NEEDS AND ALLOCATION OF RESOURCES 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. (DS)

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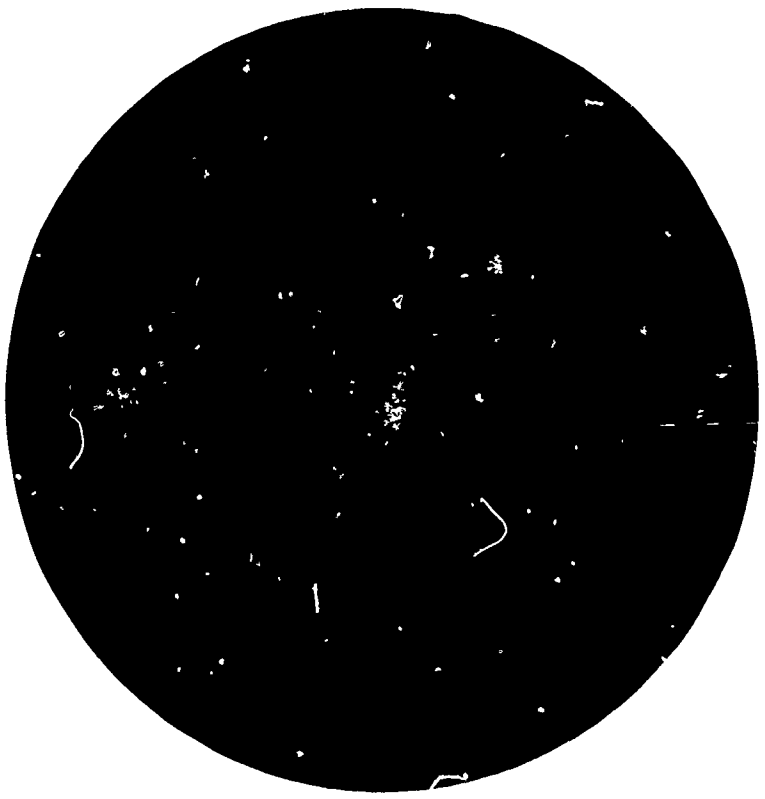

Science Policy Bulletin

Battelle Memorial Institute
Columbus Laboratories

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.

The bibliographic information is presented under a number of topical categories. Each cited publication is recorded under a single category; cross indexing is not used. 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.

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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Columbus, Ohio 43201

Attention: Dr. Robert W. Brainard

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ITEMS OF SPECIAL INTEREST

"Science and the Human Condition" is the title of a major symposium held at the University of Illinois from November 29 to December 2, 1967. Over a hundred distinguished scholars from the sciences, education, and humanities participated in the four-day program.

"The symposium arose from a conviction that university education at present fails to provide an adequate foundation for responsible citizenship in the modern world." Changes "in the human condition, so unique to our time, originate in large part in the rapid growth of science and technology. A corresponding adaptation of human institutions requires a thorough awareness of both the nature and inherent limitations of modern science. Such awareness may indeed be rapidly becoming a precondition for the exercise of responsible citizenship. Preparation for living in an 'age of science' must become an integral part of the educational process: in the formal framework, from elementary school through graduate school, and through communication with the public at large. Without such efforts the role of the responsible citizen inherent in our democratic society may become seriously diminished."

The objective of the symposium was to "develop a basis for an appropriate integration of an awareness of science and its implications within the humanities and social sciences". Toward this end, six working groups, representing different fields, were formed to develop statements for general circulation that would include "the relevance of science and technology to the particular field", "guidelines for the inclusion of appropriate factual and conceptual material in the general curriculum", and an annotated bibliography providing sources for implementing the guidelines, as well as for general background.

The symposium program included three keynote lectures, discussions of the keynote topics, the six working groups, and a plenary session to hear the reports of the working groups:

Keynote Lectures:

"Science and the Human Condition" - I. I. Rabi,
University Professor, Columbia University

"The World of Science and the Scientist's World" -
Polykarp Kusch, Professor of Physics,
Columbia University

disclosure of the facts and adequate public discussion", and the making of decisions regarding technological programs by "small, closed circles of specialists". Suggests that an independent, objective body is needed to assess the social costs of technology, and outlines the role that lawyers might play in this process.

44. Greenberg, D. S., "It's Time for Science to Act Its Political Age", Bulletin of the Atomic Scientists, v. 23, no. 8, October 1967, pp. 36-37.

"In the first two decades after World War II, political good fortune - luck - came easily to the scientific community, and, as a consequence, science had neither the need nor the incentive to develop the political instincts and mechanisms commonplace in other segments of our society. . ." The linkage between science and government developed "because the war had demonstrated the value of science and technology", not because of the scientific community exercising its political power, nor because of any "sophisticated notions of the role of research in modern society". The changing times are reflected in a recent statement by the deputy director of OST: science 'can no longer hope to exist, among all human enterprises, through some mystique, without constraints or scrunity in terms of national goals, and isolated from the competition for allocation of resources which are finite.' To deal with the new climate, "scientists themselves ought to get a better idea of just what science is all about", and "the community that administers science in Washington should. . .break out of the professional as well as social isolation that generally characterizes it." "Science has to do a better job of making known it values, its needs, and its vulnerabilities; it has to understand that Congress is not simply a bank to which it presents withdrawal slips."

45. Greenberg, D. S., "The Politics of Pure Science", Saturday Review, November 4, 1967, pp. 62-69.

Preview of Greenberg's book, to be published in 1968 (by New American Library), on "the political behavior of science, both in its relations with the nonscientific world and in its internal aspects."

46. Heilbroner, R. L., "Do Machines Make History?", Technology and Culture, v. 8, no. 3, July 1967, pp. 335-345.

An examination of "the effect of technology in determining the nature of the socioeconomic order", and implications for the future. Conclusions include: there is a roughly ordered "sequence to technological development. . ." and . . ."a necessitous path over which technologically developing societies must travel"; "a given technology imposes certain social and political characteristics upon the society in which it is found"; "technology takes on a special significance in the context of capitalism - or, for that matter, of a socialism based on maximizing production or minimizing costs. For, in these societies, both the continuous appearance of technical advance and its diffusion throughout the society assume the attributes of autonomous process, 'mysteriously' generated by society and thrust upon its members in a manner as indifferent as

BIBLIOGRAPHY

I GENERAL

30. Human Values and Advancing Technology, compiled by C. P. Hall, Friendship Press, New York, 1967, 175 pp.

    This book presents five main addresses given at the National Consultation on Technology and Human Values held in Chicago, Illinois, May 2-4, 1967: "Technology and Human Values: This American Moment" - Huston Smith; "Compassion or Destruction: Our Immediate Choice" - Robert Theobald; "Human Values in an Evolving World" - Theodosius Dobzhansky; "Brain Technology and Psychocivilization" - Jose M. R. Delgado; "Twenty-First Century Institutions: Prerequisites for a Creative and Responsible Society" - Donald M. Michael. The volume also includes working group reports on: "Technology and the World Population-Hunger Problem", "Technology and the Work-Income Issue", "Youth and the Impact of Technology", "Technology and Urban Issues", "Technology and Man's Nature", and "Technology and Man's Relation to His Natural Environment".

31. "Forecasting the Future", Science Journal, v. 3, no. 10, October 1967, 155 pp.

    A special issue devoted to "the new field of technological forecasting". Includes: "The Future of Future Research" - Robert Jungk, "Forecasting the Future" - Erich Jantsch, "Science" - Olaf Helmer, "Energy" - Ali Bulent Cambel, "Automation" - Hasan Ozbekhan, "Communication" - John R. Pierce, "Space" - Robert C. Seamans, Jr., "Transport" - Gabriel Boulador, "Food" - Robert U. Ayres, "Materials" - William L. Swager, "Population" - Roger Revelle, "World Futures" - Herman Kahn.

32. "Science Dilemma: Computer versus Copyright", Scientific Research, v. 2, no. 10, October 1967, pp. 36-38.

    A brief statement on the status of the proposed revisions to the copyright law that deals with the "property rights of the authors and publishers of scientific papers, journals and books stored in computers", and the positions of interested parties.

33. "Science Policy Information 3", Directorate for Scientific Affairs, Organisation for Economic Co-operation and Development, Paris, no. 22913, October 1967, 105 pp.

    Science policy news, information, and abstracts from OECD countries and international programs.

34. The Science of Science Foundation Newsletter, v. II, no. 4, October 1967, 12 pp.

The bimonthly Newsletter "is concerned with topics of interest in the field of the science of science", and includes activities of the Foundation, news, and reports dealing with science policy matters.

35. "Toward the Year 2000: Work in Progress", DAEDALUS, v. 96, no. 3, Summer 1967, pp. 639-1002.

A record of the work in progress by the American Academy's Commission on the Year 2000. The Commission is "an effort to indicate how the future consequences of present public-policy decisions, to anticipate future problems, and to begin the design of alternative solutions so that our society has more options and can make a moral choice, rather than be constrained, as is so often the case when problems descend upon us unnoticed and demand an immediate response". The record includes transcripts of the working sessions, and essays on specific problems and topics (e.g., mechanisms for planning and predicting, urban development, education, religion, psychology, communication, and the future international system).

36. Boulding, K. E., "Dare We Take the Social Sciences Seriously?" American Behavioral Scientist, v. 10, no. 10, June 1967, pp. 12-16.

A discussion of science as a subculture, the similarities and differences between the physical, natural, and social sciences, the subject matter and developmental status of the different social sciences, the possibly premature specialization and separation of the social sciences, examples of "policies of government in which the failure to recognize that what was involved was essentially a social system has led if not to disaster to at least gross inefficiency", and the need for "social data stations" to collect data continuously on the "sociosphere". The answers to the two questions of could and should we take the social sciences seriously, is a "cautious affirmative" in both instances. Discusses the money, mechanisms, and "images" necessary for the effective development and use of the social sciences, the impact of the social sciences (e.g., they "present much more of a challenge and a problem to the politician than do the physical or biological sciences"), and the fundamental dilemma confronting the social sciences of how to "find a niche in the power structure which does not confine or corrupt its occupant".

37. Calder, N., "What is Future Research?", New Scientist, v. 36, no. 570, November 9, 1967, pp. 354-355.

Defines and discusses "Future Research" and some of the current activity in the area. "'Future research' is the systematic study of trends and goals, in the technological and social spheres, for periods of a decade or more into the future". "Spontaneously and largely independently, individuals and groups from many disciplines have begun serious programmes of future research". "One can recognize two main strands, corresponding to the social sciences on the one hand and the natural sciences

and technology on the other--the former confronted with the social issues raised by economic development, technological change, and domestic and international strife; the latter anticipating a bewildering change of possible applications of science". "Technological forecasting is the department of future research that has so far emerged most strongly."

38. Commoner, B., "The Eroding Integrity of Science", Science and Technology, no. 70, October 1967, pp. 51, 52, and 59-60.

The integrity of science--"the internal structure and required procedures of science" that "influence the behavior of the individual scientist"--is being eroded "under social and political pressures". Government secrecy in connection with biological warfare research and the Starfish Project are given as an example of the "erosion". Discusses the need for getting the "issues across to the public, which after all must make the value judgments", in order to avoid risking "the future of the world on the moral wisdom of a few technologists"; the increasing involvement of scientists in informing the public; and the author's position on molecular biology and some of its practical implications.

39. Daddario, E. Q., "A Challenge to the Scientific Community", Remarks at the Autumn Meeting of the National Academy of Sciences, University of Michigan, Ann Arbor, Michigan, October 23, 1967, 5 pp.

Remarks include: the pivotal and complementary roles of science and government in attacking our mounting problems; the competition for limited resources and the need to establish rational priorities; the need for scientists to recognize the political facts of life; the lack of effective liaison between science and the legislature; the need to tighten "relationships of science and technology with every part of our national life"; the prejudices of legislators and those of scientists that prevent cooperation; the responsibility of science to identify and adapt to the shifting needs of society; and the need for scientists to "get further into the act" of dealing with our national problems.

40. de Solla Price, D. J., "Nations Can Publish Or Perish", Science and Technology, no. 70, October 1967, pp. 84-88, and 90.

An analysis of scientific output, in terms of published technical papers, and its relationship to GNP, population, and per capita income. Conclusions include: the extent and direction of basic research is tied directly to overall economic wealth, rather than to nationalistic goals or practical considerations; "it is only in applied science and technology that activities are disproportionally distributed amongst the nations. . .and directly tied to national goals"; "there is a universal admission price to the scientific arena" which at present "costs about 0.7% of gross national product, and the price will double in the next ten years"; "a genuine scientific effort requires about 0.7% of national wealth. With few exceptions, countries either participate in basic science to this extent or they stay out of the race completely"; in "the applied fields of research and development there is a real ceiling on size

of effort--about four times that devoted to basic research"; and "while nations can have little direct effect on the mix of scientific specialists, they can have a major influence on the specific directions of their work--especially in applied R&D".

41. Dubos, R. J., "Scientists Alone Can't Do the Job", Saturday Review, v. 50, no. 48, December 2, 1967, pp. 68-71.

Excerpts from a series of lectures collectively titled "Science and Human Affairs" sponsored by Columbia University's Institute for the Study of Science in Human Affairs: "the effects of modern science and technology reach suddenly into the physical and mental lives of. . .people and affect simultaneously all aspects of society"; the "most hopeful aspect of the science-society interplay is. . .the soul-searching which is going on at present within the scientific community"; science is issuing many "promissory notes", in order to obtain public funds for research, for the solution of "practical problems at the expense of disinterested knowledge"; "science is betraying its ideals by accepting the mores of the marketplace"; a more sophisticated knowledge of social needs is required "if we want science to fulfill its social role"; the "technological fix" and piece meal engineering "engages society in channels from which it cannot escape, and that lead to disaster"; science cannot define or impose social goals and values, but it can contribute "by providing a more factual basis for options"; "it is essential that the public. . . participate in the formulation of the overall strategy of scientific research"; and science would benefit from the kind of "evaluation that professional critics give to other human activities."

42. Freeman, C., "Research Comparisons", Science, v. 158, no. 3800, October 27, 1967, pp. 463-467.

Discusses the inadequacies of R&D expenditures as meaningful indicators of "technology gaps", the need to distinguish invention from innovation, the development lead times in the U. S., U.S.S.R. and the U.K. and their bases, the conditions for innovation and diffusion, and the need for industrialized countries to strengthen the "problem-solving capacity" of underdeveloped countries.

43. Green, H. P., "The New Technological Era: A View from the Law", Bulletin of the Atomic Scientists, v. 23, no. 9, November 1967, pp. 12-18.

"Our national commitment to technological advance seems irresistible, irrevocable, and irreversible." "Can our legal system impose effective social control over new technologies before they inflict substantial or even irreparable, injury upon society?" The rapidity of technological innovation, especially when supported on a massive scale by the Federal government, often produces social problems before the legal system can create new rules of law adequate to deal with the problems; and, the courts tend to rely on the government's expertise. . .regarding the hazards of the technology and the causal relationships between technology and particular injuries". The radiation-producing technology is examined in detail to illustrate the prevalent public policies with respect to technology. Comments on the lack of "candid

disclosure of the facts and adequate public discussion", and the making of decisions regarding technological programs by "small, closed circles of specialists". Suggests that an independent, objective body is needed to assess the social costs of technology, and outlines the role that lawyers might play in this process.

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it is imperious"; "technological determinism is thus peculiarly a problem of a certin historic epoch. . .in which the forces of technical change have been unleased, but when the agencies for the control or guidance of technology are still rudimentary"; "the surrender of society to the free play of market forces is now on the wane, but its subservience to the impetus of the scientific ethos is on the rise. . .From what we can foretell about the direction of this technological advance and the structural alterations it implies, the pressures in the future will be toward a society marked by a much greater degree of organization and deliberate control"; "technological determinism. . .will remain germane until there is forged a degree of public control over technology far greater than anything that now exists".

47. Helmer, O., "Science", Science Journal, v. 3, no. 10, October 1967, pp. 49-53.

Some predictions from the Delphi technique for the year 2000; 10 million scientists and engineers in the U. S., and 25 million world-wide; scientific and engineering productivity will rise by a factor of 10; the "purists' motto of 'science for science's sake' will carry less weight than the pragmatist's 'science for society's sake'"; "the growing ability to do something about the future, from which the scientific community's new sense of social responsibility derives, will come to full fruition"; "the beginning of a true symbiosis between man and machine, where in a very real sense man's intelligence will be enhanced"; the social sciences will adopt "an interdisciplinary systems approach to the solution of socio-political problems" which "may even equal or exceed in importance that of the achievements credited to the technologies arising out of the physical sciences". Includes a table of major breakthroughs expected by a panel of 20 experts.

48. Lear, J., "Policing the Consequences of Science", Saturday Review, v. 50, no. 48, December 2, 1967, pp. 65-67.

A continuation of the report on the "developing struggle between the traditions of science and the traditions of democracy", including some measures that are being taken to police the social consequence of science and technology. Includes excerpts from the exchange between the editorial position of Science and Rep. Fountain concerning his critical attack on NIH; a description of the new "Board of Medicine" created by the National Academy of Sciences to look into ways for more effective application of biomedical knowledge "to critical human needs", and to examine the potential personal and social consequences of new capabilities in this area; and the planned publication of a new journal devoted to forecasting technological advances and exploring the "social and environmental changes resulting from these new technological advances".

49. Matveyev, A., "UNESCO and the Natural Sciences", UNESCO Chronicle, v. 13, no. 5, May 1967, pp. 200-205.

A broad review of UNESCO's 19-million dollars a year science program that is "aimed at advancement of science and its application to development". Includes a discussion of the priorities, the criteria in defining these priorities used in UNESCO's program, along with a brief description of the three parts of the program: science policy (to assist nations in planning their scientific organization); advancement of science (concentration on priority sectors, development of international cooperation, strengthening of links between UNESCO and the world of science); application of science to development.

50. Mendelsohn, E. I., "The Confrontation of Science, Technology and Modern Society", Contemporary Civilization 4, Scott, Foresman, and Company, Glenview, Illinois, 1967.

"By splitting the atom, science achieved a relevance to the life and death of human societies from which it is impossible to retreat. . . The two massive scientific efforts to the last 25 years - the science of warfare and the science of space - and the 2 major scientific questions of the present and future - automation and biomedical advances - will provide the major examples of the intertwinings of science and society in the pages that follow." Considers the scientific conscience and the responsibility of scientists in public policy.

51. Mesthene, E G., Technology and Social Change, Bobbs-Merrill Company, Inc., Indianapolis, Indiana, 1967, 64 pp.

"The essays collected in this small volume illustrate the dimensions and importance of such questions and can help us to answer the major question: What are the implications of today's rapid advances in science and technology?" Articles by H. A. Simon, J. Lederberg, H. Brooks, A. M. Weinberg, J. Ellul, E. G. Mesthene, and J. R. Platt.

52. Powell, C. F., "Promise and Problems of Modern Science", Nature, v. 216, no. 5115, November 11, 1967, pp. 543-546.

In his concluding address at the symposium on "Perspectives of Nuclear Physics, Elementary Particle Physics, Radio-chemistry and Nuclear Chemistry", the author discusses some of the problems of the advancement of science in the future. "A country not involved in some aspects at least of advanced science tends to be outside the main stream of human development with the most serious consequences for its intellectual life and its productiv[illegible]power"; "the justification for great expenditures on fundamental science has three aspects": "its effects on the general body of science. . . the practical consequences. . .the pursuit of knowledge is an essential element. . .in our universities"; "if science and technology have a tremendous impact on our societies, it is no less true that they are dependent on the general tone of the society in which they exist, on prevailing attitudes towards science, on the esteem in which it is held"; "the benevolent role of science as the instrument for human advancement. . .is now seriously called into question"; "science is tending to be more and more confined to the scientifically advanced states"

"reinforced by the migration of substantial members"; in "the interests of science itself. . .it is important that. . .scientists . . .show themselves to be more than narrow specialists indifferent to the consequences of their discoveries".

53. Riecken, H. W., "Government-Science Relations: The Physical and Social Sciences Compared", American Psychologist, v. 22, no. 3, March 1967, pp. 211-218.

Examines the relationships between the Federal Government and the social sciences, and compares it with the government-physical science relationship. Conclusions include: social science receives poor treatment with respect to funding; the funding disparity between the social and physical sciences cannot be accounted for by the lower costs of social science research; the lack of support has led social scientists to settle for smaller aims and less effective methods; the limited practical applications from the social sciences is a major impediment to government support; the impact of the social sciences on "the quality of life" is of the same nature as that of the biological and physical sciences, but the government gives much more attention to regulating research in the social sciences; and the social sciences need "more support", "more sympathetic understanding of their true capacities and promise", and relief from "the suspicion that they are destructive of integrity and autonomy, and the unrealistic hope that they can, by themselves, resolve the worst difficulties into which our world can get and has gotten itself".

54. Salomon, J., "Progress in Science Policy", OECD Observer, no. 30, October 1967, pp. 12-15.

Comments by the Head of the OECD Science Policy and Resources Division on a seminar concerned with the application of science to the formulation and implementation of public policy. The seminar and comments, center on very broad themes: science and public policy; science and the economy; fundamental research and applied research and development; allocation of resources; and international scientific relations.

II SCIENCE, DOMESTIC PROBLEMS, AND NATIONAL GOALS

24. A Strategy for a Livable Environment, A Report to the Secretary of Health, Education, and Welfare, by The Task Force on Environmental Health and Related Problems, U. S. Government Printing Office, Washington, D. C., June 1967, 90 pp.

    Recommends a $2.5-billion HEW program for a five-year period, which includes ten Action Goals, a strategy for their accomplishment, and other recommendations related to the goals and a protection system. A major impediment to accomplishing the overall program is the lack of operating funds at the local government level; the "simple approach of supplying operating revenues to the cities would not solve the long range problems." Suggests a White House Conference on Financing Local Government "to explore ways for cities and other units of local government to raise adequate funds to finance essential government activities on a metropolitan and regional scale."

25. "America's Changing Environment", DAEDALUS, v. 96, no. 4, Fall 1967, pp. 1003-1224.

    The first in a series of studies planned by the Academy of Arts and Sciences to examine several critical fields--health, education, conservation, urban affairs--and to make recommendations for development programs which would make the "nation more capable of coping with the large social and economic problems characteristic of an advanced industrial society". The study, which was headed up by Roger Revelle, is instead, a set of essays dealing with ecology and conservation, resources, pollution, aesthetics, urban planning, recreation, and associated education. This study group "came to recognize that what was called for was not so much the devising of programs as the posing of proper questions". "The study is important precisely because it says that we cannot proceed as we have been going. Our problem is not simply finding new funds to support programs which are obviously desirable, but admitting our ignorance in certain crucial areas, and seeking to remedy this ignorance as a prelude to acting responsibly".

26. "Bibliography of Research Relating to the Communication of Scientific and Technical Information", Bureau of Information Sciences Research, Rutgers--The State University, New Brunswick, New Jersey, 1967, 732 pp.

    Bibliography from 1955 through June 1965, covering all aspects of generation, acquisition, processing, storage, retrieval, and use of information.

27. National Symposium on Science and Criminal Justice, U. S. Government Printing Office, Washington, D. C., 1967, 189 pp.

    Report covering the two-day symposium held in June 1966 on problems of criminal justice and the applications of technology.

28. "Policy Planning for Technology Transfer", U. S. Senate, Ninetieth Congress, First Session, Washington, D. C., 1967, report of Subcommittee on Science and Technology, to Select Committee on Small Business, prepared by Science Policy Research Division, Legislative Reference Service, Library of Congress, 183 pp.

An analysis of the current knowledge, policies, and practices associated with the "transfer to the business community of technology resulting from large Federal R&D program." Includes a description and analysis of existing transfer programs, suggestions for alternative transfer, concepts and mechanisms, congressional interest in transfer, international aspects, economic factors in technological change (including barriers), the process of technology transfer, and the roles of different institutions in the transfer process.

29. "Racial Studies: Academy States Position on Call for New Research", Science, v. 158, no. 3803, November 17, 1967, pp. 892-893.

A position statement by the National Academy of Sciences regarding research on "the relative importance of heredity and environment as causes of human social problems and as causes of racial differences in behavioral traits." The statement questions "the social urgency of a greatly enhanced program to measure the heritability of complex intellectual and emotional factors", and the "social urgency of a crash program to measure genetic differences in intellectual and emotional traits between racial groups", and presents its rationale for this position.

30. "Some Aspects of United States Energy Policy", OECD Observer, no. 28, June 1967, pp. 27-32.

A description of the U. S.'s energy policy and an appraisal of it by OECD representatives from Germany and Italy. The objective of the policy is "to assure an adequate supply of cheap energy, diverse in form and geographic source but drawn largely from domestic sources--produced and used in ways that cause no permanent damage to either health or environment." Describes the policy-making and regulating bodies and the role of the private sector, and some of the future problems (e.g., pollution, possible depletion of domestic oil, reconciliation of the various, and often conflicting, objectives of the energy policy). Comments of the examining countries include: the "policy does not conform to a uniform and rational plan"; "regulation of the energy sector is aimed. . .at the achievement of more general national goals"; the policy "contains a liberal element and a strongly protectionist and dirigistic element"; the policy is "far from keeping to an abstract theory of laissez faire"; the fiscal policy "distorts the effect of competition not only inside the United States but also abroad and prompts other countries to adopt counterbalancing measures".

31. "State Technical Services Act Draws Fire", Chemical and Engineering News, v. 45, no. 43, October 9, 1967, pp. 48-49.

Reviews the origins, objectives, and accomplishments of the State Technical Services program which is aimed at transferring the results of the federally generated R&D to the private sector, and presents an appraisal of the program by the Commerce Department's Office of Technical Services.

32. "State Technology Program: Problems Remain", Washington Science Trends, v. XVIV (sic), no. 2, October 16, 1967, pp. 7-8.

The State Technical Services program, designed to put advanced technology in the hands of local business, appears to have weathered some of its early troubles, although serious budget problems remain. Reviews status and trends in the program, including probable cuts in the '68 budget, and the need for some objective measure of the costs and benefits of the program to "replace the anecdotes which we tend to use in discussing technology transfer".

33. "Technology Transfer and Innovation: A Guide to the Literature", U. S. Clearinghouse for Federal Scientific and Technical Information, Washington, D. C., 1967, 25 pp.

34. "Technology Transfer Programs Not Much Help to Small Business", Chemical and Engineering News, v. 45, no. 42, October 2, 1967, pp. 18-19.

The conclusion from initial hearings on technology transfer before the Subcommittee on Technology of the Senate Small Business Committee is that government programs "are not helping small business very much." The Office of State Technical Services was critized for its long range planning and research, overcontrol by the Federal government, and the changing emphasis from support in management to support of industry at the technical and production levels; reorientations are suggested. NASA and AEC programs were critized for the difficulties they impose on acquiring information, as well as for their limited relevancy to small business.

35. Carlson, J. W., "Aspects of the Diffusion of Technology in the United States", prepared for the Fifth Meeting of Senior Economic Advisers, Economic Commission of Europe, United Nations, Geneva, Switzerland, October 2, 1967, 52 pp.

This paper considers the forces which direct technological change, the characteristics of the investors and performers of R&D and some aspects of the diffusion of technology, "The application of technological knowledge appears to be determined primarily by the changing demand of consumers, producers, and the government, and by the changing relative prices of inputs for making products"; reviews the roles of government, industry, nonprofits, and the universities as R&D investors and performers, and presented the associated statistical data; examines some of the channels (and barriers) for transferring technology, and concludes that further "study of the entire process from the creation of technological knowledge to its diffusion is both worthwhile and necessary".

36. Crewe, A. V., "Science and the War on. . .", Physics Today, v. 20, no. 10, October 1967, pp. 25-30.

Scientists can and must take the initiative in helping society solve such problems as air and water pollution and crime: it "is up to the scientific community to point out where they can help." Discusses the needs and aspects of the problems to which science and technology is relevant.

37. Gilmore, J. S., et al, The Channels of Technology Acquisition in Commercial Firms, and the NASA Dissemination Program, U. S. Clearinghouse for Federal Scientific and Technical Information, Washington, D. C., June 1967, 144 pp.

This report, prepared by the Denver Research Institute for NASA, "examines some of the problems of making government R&D results available for broad industrial use. It describes the technology acquiring process by which commercial firms get externally-generated technological information. Based on these findings, it suggests how government-developed technology might better be communicated to industrial firms through the communication channels they customarily use."

38. Gilmore, J. S., Ryan, J. J., and Gould, W. S., "Defense Systems Resources in the Civil Sector: An Evolving Approach, An Uncertain Market", U. S. Arms Control and Disarmament Agency, July 1967, 201 pp.

This study, prepared by the University of Denver Research Institute, is "primarily concerned with the systems capability of defense firms, and with the usefulness of this capability in helping public agencies solve non-defense, public sector problems." "The report deals with. . . the applicability of the defense firms' capabilities in this field. . . suggests. . .government actions and institutional changes. . .to enhance prospects for utilizing defense systems resources in the civil sector" and examines the prospective civil market as a "field for diversification or conversion in the case of cutbacks in defense spending." Concludes that systems analysis is a powerful tool for dealing with some civil problems, but only if certain institutional and political obstacles are removed; that civil systems work is "unlikely to absorb any great share of total defense resources"; that "its greatest promise is in improving the quality of government administration." Includes an appraisal of the widely publicized civil system analysis studies sponsored by the State of California in 1965. (See Science, v. 158, no. 3804, November 24, 1967, pp. 1028-1030, for a review of the study)

39. Macy, B., Bednar, J. M., and Roberts, R. E., The Impact of Science and Technology on Regional Development - Final Report, prepared for the Office of Regional Development Planning, U. S. Department of Commerce, Kansas City, Missouri, Midwest Research Institute, July 1967, 168 pp.

"This study was undertaken under auspices of the Office of Regional Development Planning with the specific intention of providing background information to the Regional Commissions" which are "fundamentally and ultimately concerned with improved job opportunities and higher

income levels." Contents include a discussion of the Characteristics of Science and Technology, of the relationship of Science and Technology to Regional Growth, of Alternative Action Forms and Their Determinants, and of the Implications for the Regional Commission.

40. McHale, J., "Science, Technology, and Change", Annals of the American Academy of Political and Social Science, Social Goals and Indicators for American Society-Volume II. University of California Press, Berkeley, September 1967, pp. 120-140.

A review and assessment of the indicators of scientific activity, technological change, and social progress. "The narrowing interval between scientific discovery, technological implementation, and social use has increased the general rate of change. Our monitoring and accounting procedures for . . .such changes. . .and for their short and long-term consequences, are. . .inadequate. The. . .indicators . . .tend to be quantitative rather than qualitative. To provide more positive measures of social progress, and earlier warning of the social and environmental effects of new scientific-technical developments, we need to redesign our present indicator proceduces."

41. Mondale, W. F., "Some Thoughts on 'Stumbling Into the Future'", American Psychologist, v. 22, no. 11, November 1967, pp. 970-973.

A description and discussion of the proposed "Full Opportunity and Social Accounting Act", by its sponsor. Reviews the need for social accounting, some of the primitive starts in this direction, and major provisions of the bill ("full social opportunity for all Americans as a national goal"; "a President's Council of Social Advisers"; "requires the President to submit an annual Social Report, comparable to the Economic Report"; and "establishes a Joint Congressional Committee on the Social Report"), and the expected benefits (e.g., "sharpen our quantitative knowledge of social needs"; "allow us to measure. . . our progress toward our social objectives"; "help us determine priorities among competing social programs").

42. Nelson, B., "Thermal Pollution: Senator Muskie Tells AEC to Cool It", Science, v. 158, no. 3802, November 10, 1967, pp. 755-756.

A brief discussion of congressional concern with the potential thermal and radioactive pollution hazards of nuclear power plants, and the conflict between AEC policies and water quality standards.

43. Schlesinger, J. R., "Systems Analysis and the Political Process", The RAND Corporation, P-3464, June 1967, 31 pp.

An evaluation of the role for system analysis in the "highly political" environment of government. Following a brief discussion of (1) the equality of existing information bases and analyses, (2) methodology, (3) bias, and (4) the impact of politicized environments on analytical efforts and analytical results, the general limitations of systems analysis imposed by political objectives and constraints are examined, the relevancy of DOD experience to civilian program is analyzed, predictions are made as to how "systems analysis will fare as it encounters the passive resistance of the bureaucracy", and an appraisal is made of what systems analysis can be expected to accomplish.

44. Sinclair, M. P., "New Technology for Crime Fighting", Industrial Research, v. 9, no. 12, November 5, 1967, pp. 84-90.

"Crime is costing the U. S. more than $20-billion a year, yet the Justice Department is the only cabinet department with no share of the. . .federal R&D budget" although "some $6.7-million has been made available over the past two years for research projects under the aegis of the Law Enforcement Assistance Act of 1965. Eighty-eight grants and contracts have been made to various institutions for the development of information and communications systems and other scientific and technological research." Describes the variety of gadgets and techniques recently developed and proposed for use in crime prevention and detection.

III NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE

18. "Budget Uncertainties Plague Federal Research", Industrial Research, v. 9, no. 13, December 5, 1967, p. 13.

> "Uncertainty envelopes fiscal year 1968 R&D budgets at this late date. Even those agencies whose appropriation bills have been passed are threatened by a Congress debating whether to employ a scalpel or a meat ax in its search for economy." Discusses the four steps in the budget process (request, authorization, appropriation, and expenditure) as necessary background for understanding what is taking place, and the current congressional maneuvering. At this point, the "only certainty is the $1-billion in R&D cuts already made."

19. "Hearings Before the Subcommittee on Government Research", U. S. Senate, Committee on Government Operations, National Foundation for Social Sciences, Ninetieth Congress, First Session, Senate Bill No. 836--Part I, Washington, D. C., February 7, 8, and 16, 1967, 261 pp.

> Hearings held by Senator Harris' subcommitte on his bill to create a national foundation for the social sciences, including statements by interested agencies and data on funding patterns in the social sciences.

20. "National Science Foundation Appropriation Highest on Record", Washington Science Trends, v. XIX, no. 4, October 30, 1967, p. 19.

> NSF's 1968 appropriation is increased by about $15-million over the 1967 level to $495-million. The appropriation is $31-million less than requested, but with $21-million previously committed to Project Mohole available for general use in this fiscal year, the total funding is only $10-million under NSF's request of $526-million. With the enlarged budget, NSF is expected to significantly increase its funding in the areas of Basic Research Project Support, National Research Centers, Institutional Support for Science, National Sea Grant Program, and Science Information Activities.

21. "Outlook Grim for Federal R&D Spending", Chemical and Engineering News, v. 45, no. 47, November 6, 1967, p. 38.

> Federal R&D spending seems likely to hold near the same level as last year--about $16.5 billion, but it could drop as low as $15.4 billion. "So far, more than $1 billion has been cut from the R&D appropriations for the current fiscal year and the process is continuing." "As for next year, appropriations are unlikely to be any higher than those for this year", because "science and research and development are not the darlings of Congress that they were in the late 50's and early 60's", and pressures for budget cuts will continue into next year's elections.

22. "Research Need is Up, But Dollars are Not", Scientific Research, v. 2, no. 10, October 1967, pp. 34-36.

A general discussion of the effects of the financial pinch on biosciences at NSF, of the increasing needs in this area, of the concept that NSF is an effective balance wheel in the overall Federal system of research support, and of the relationships between NSF and NIH in the biosciences.

23. "Resources Devoted to Research and Development in OECD Member Countries", OECD Observer, no. 30, October 1967, pp. 32-37.

Comparative statistical data from OECD countries on the resources devoted to R&D during the '63 - '64 period: includes the gross national expenditures (in national currency and dollars) and the number of full-time scientists and engineers in R&D for the U. S. and other OECD members; R&D as related to GNP, the number of scientists, engineers and technicians per 10,000 population, and R&D expenditures per capita of population; percentage of the total national R&D efforts devoted to basic research, applied research, and development; percentage allocation of R&D resources between different research objectives (atomic, space, defense, economically motivated, welfare) and R&D expenditures analyzed by sector of source and sector of performance. Subsequent reports will present detailed analyses by sectors: business enterprise, government, private and non-profit, and higher education.

24. Statistics of Science and Technology, Department of Education and Science and Ministry of Technology, London, Great Britain, HMSO, 1967, 96 pp.

The first of an annual series, this publication aims to bring together available statistics relevant to science and technology such as expenditure of R&D, deployment of qualified manpower, and certain aspects of the training of scientists and technologists.

25. "U. S. IBP Effort Drags for Lack of Funds", Scientific Research, v. 2, no. 11, November 1967, pp. 35-36.

Describes the status of the five-year International Biological Program which entered its active phase in July '67 after a long planning period. "The U. S. has, on paper, the largest and most ambitious IBP program of all 44 contributing nations." "But the U. S. IBP planners have so far gotten only a fraction of their program off the ground and are running into heavy difficulties in getting funds for the rest." The program's problems include: a lack of visibility; an emphasis on environmental biology (which runs counter to the prevailing emphasis on biochemistry and molecular biology among U. S. biologists); and its multidisciplinary, in-house and outside research character makes it difficult to devise a funding scheme.

26. Boffey, P. M., "Federal Research Funds: Science Gets Caught in a Budget Squeeze", Science, v. 158, no. 3806, December 8, 1967, pp. 1286-1288.

Presents Congressional appropriations for R&D in 1968, broken down by government agencies and area of R&D, and compared with the 1967 appropriations. Congressional cuts "are believed to have dropped aggregrate federal support of research and development below last year's level of roughly $16.5 billion." However, it is estimated that "Congress increased the research component of R&D above last year's level, and that it also boosted federal support of academic science". Overall, "science received rougher-than-usual treatment. . . though things could have been worse". NASA suffered the deepest cuts of any science-oriented agency (more than half a billion less than requested) with its sustaining university program being particularly hard hit (less than a third of last year's appropriation). DOD's appropriation remained about the same as 1967, but support of basic research is to be cut back. NIH, AEC, HEW, and NSF all received modest increases, but less than requested. The next hurdle for the R&D budget is the administration's budget-cutting scheme which will "impose an across-the-board reduction in all agencies without worrying about the question of priorities". "The precise programs that will be affected in various agencies are not known".

27. Greenberg, D. S., "Money for Research: Prospects for Next Year are Gloomy", Science, v. 158, no. 3798, October 13, 1967, pp. 230-233.

After "several years of relatively tight financial rations, the national scientific enterprise now can at best look forward to still another year of the same, but is more probably moving from a phase of manageable scarcity into a period of disruptive privation. Relative to other segments of American society. . .research is not, nor is it ever likely to be, badly off." "One of the paradoxes of the situation is that, while scientists ruefully anticipate next year's money prospects, the view from Capitol Hill is that R&D is an overstuffed field of federal activity and merits a vigorous trimming."

28. Harris, F. R., "National Social Science Foundation: Proposed Congressional Mandate for the Social Sciences", American Psychologist, v. 22, no. 11, November 1967, pp. 904-909.

The case for establishing a National Social Science Foundation, based on recent hearings of the Senate Subcommittee on Government Research, is presented by the Chairman of the Subcommittee: Federal expenditures for science have concentrated on the natural and physical sciences, while "the social sciences virtually have been left out"; the "social sciences need national recognition and a strong mandate for the vital role they can and must play in combating poverty, ignorance, and crime and the vast international challenges we face"; "creation of the Foundation would bring to the social sciences infusion of money, prestige, and recognition at the national level"; the proposal to expand NSF's support of the social sciences in lieu of setting up a NSSF "is simply not a realistic aspiration" and "would likely mean more of the same" inadequate treatment they have so far received; with the NSSF, "the social sciences will receive a strong legislative and administrative base and a place in the highest councils of Government, something they have not had before".

29. Rossi, P. H., "Adventure Capital for Research", Saturday Review, November 4, 1967, p. 68.

A proposal for government support of "research that takes advantage of sudden and often unanticipated events to study their impact on individuals and social systems", of long-range studies to "assess the impact of massive social changes", and of certain research topics that tend to be slighted.

30. Wilson, G. C., "Research in a Backlash, or Nike X as Exhibit A", Astronautics and Aeronautics, v. 5, no. 12, December 1967, pp. 6-7.

A discussion of the current political atmosphere as it relates to R&D spending, with the Nike-X decision typifying the current mood. Congressional hearings on the DOD budget "showed a fundamental disenchantment with the present research structure and a hard-headed determination to change it". Reductions in the DOD research budget should be "applied for the most part to grants and contracts with colleges and universities but that no part of the reduction be applied to Project Themis", and "in view of the programs in support of education that have been recently enacted into law, defense spending in this area can safely be reduced". The same administration's "economy wave is eroding the research programs of other federal agencies, such as NASA and the AEC". In short, Nike X(which "passes the test of the neo-isolationists"), "the Vietnam War, and Congressional reluctancy to pay for intangible projects are all ganging up on the federal research program we know today".

IV NATIONAL R&D PROGRAMS

24. "Federal Research and Development Programs: The Decisionmaking Process", U. S. House of Representatives, Committee on Government Operations, Ninetieth Congress, First Session, August 1967, Comments by the National Academy of Sciences and the Bureau of the Budget, 16 pp.

    Recommendations of the Research and Technical Programs Subcommittee regarding "deficiences in the Federal R&D decisionmaking process", and comments by the National Academy of Sciences and the Bureau of the Budget. Recommendations include greater use of outside experts in analyzing and formulating R&D plans in civilian sector areas, Executive Office examination of program-level R&D recommendations, the use of a cost-benefit approach in evaluating R&D proposals, and an annual presentation of a "Science and Technology Report" by the Executive Office similar in scope to the Economic Report.

25. "Fund Cuts Force 2-Year Stretch in MOL", Aviation Week and Space Technology, v. 87, no. 22, November 27, 1967, p. 22.

    "Defense Department budget cutbacks are stretching the original timetable for the initial crewed launch of the Air Force's manned orbiting laboratory (MOL) by at least two years and possibly longer. The present hope is that a two-man MOL satellite may be placed into orbit by late 1970 as opposed to the original date of sometime in 1968. But 1971, appears more likely within the framework of budgetary restraints already imposed. In addition, the MOL program will require a substantial increase in its funding level in Fiscal 1969 if it is even to approach present schedules. This may be difficult to obtain in a year when the defense budget is expected to receive a severe mauling as the Administration attempts to limit spending just prior to the presidential election."

26. "Oceanography, 1966. Achievements and Opportunities", Committee on Oceanography, Division of Earth Sciences, National Academy of Sciences-National Research Council (Pub. 1492), Washington, D. C., 1967, 183 pp.

    A report which assesses the current status of oceanography and makes recommendations concerning the organization, management and support of oceanographic programs.

27. "Review of the Soviet Space Program", Report of the Committee on Science and Astronautics, prepared by the Science Policy Research Division, Legislative Reference Service, Library of Congress, Washington, D. C., October 1967, 138 pp.

    Prepared by the Science Policy Research Division of the Library of Congress, this report concludes that the Soviet space program "in terms of hardware and resources is roughly the same as ours", the Soviet program costs two percent of their GNP, as compared with one percent of the U. S., "the Russian lead in tonnage of payload has

continued to grow", and "the Soviet program has unfolded in an orderly way" and has "a varied complex of mission goals as widespread as our own."

28. "The National Space Program: Its Values and Benefits", Staff Study, U. S. House Committee on Science and Astronautics, Subcommittee on NASA Oversight, Ninetieth Congress, First Session, Washington, D. C., 1967, Serial D.

"This report gives some indications of the effect that the space program has had upon our daily lives and what may be expected in the future. . .It is apparent from the amount of space-developed technology flowing into every aspect of American industry, hospitals, and universities that NASA's technology utilization progress is filling an important need, and the transfer of technology to all sectors of the American economy should remain a priority undertaking of NASA."

29. United States Activities in Spacecraft Oceanography, The National Council on Marine Resources and Engineering Development, U. S. Government Printing Office, Washington, D. C., October 1, 1967, 44 pp.

This booklet "is an introduction to current United States research in the use of spacecraft for study of the oceans." Includes brief descriptions of studies in: sea surface temperature and currents, sea state, marine biology, sea ice, oceanographic data relay and positioning, and oceanographic analysis of Gemini photography.

30. "Weather Modification", Eighth Annual Report, 1966, National Science Foundation, NSF 67-9, 1967, 132 pp.

Reviews and assesses the national weather program, describes the significant developments (technical and legislative), and concludes that the present level of effort "falls short of what is warranted by existing scientific opportunities"; that a "carefully planned and coordinated national program" is needed; that an effort "of the magnitude envisioned. . .will demand a several-fold increase in the supply of trained manpower, and indeed the problem of manpower could be the most serious impediment to a rapid buildup in the. . . effort"; and that machinery is needed for establishing priorities and organization of large-scale projects.

31. Golovin, N. E., "U. S. Space-Flight Affairs and Decisions: 1957-1967", Astronautics and Aeronautics, v. 5, no. 10, October 1967, pp. 51-60.

"A discussion of the principal events and decisions during the formative years of space explorations. . . ." Describes the "change in content and emphasis of the motivations for the space program", as viewed by the PSAC: in '58, the rationale centered on man's urge to explore defense, national prestige, and scientific research; in '61, "national prestige" was at the top of the list, "man's urge to explore" had been dropped, and "practical civilian applications" and "possibilities for international cooperation appeared for the first time"; by 1967, the list picked up "indirect benefits to the over-all economy", "manufacturing excellence", "growth in national confidence", and a "drive in the direction of increased international cooperation". Concludes "that one of the most important results. . .of the. . . space program. . .has [the] enhancement and broadening of the federal

government's role in American science and technology; in helping to endow this role with a comprehensive and persuasive rationale; and in paving the way eventually to more effective utilization by our society of its resources on a national scale for purposes other than space exploration as well as for this purpose."

32. Karth, J. E., "Prospects for Progress: Space in the 1970s", Astronautics and Aeronautics, v. 5, no. 10, October 1967, pp. 86-92.

The "NASA part of the national space program no longer has a very high priority." Aside from Vietnam, "the plight of our troubled cities, the needs of education", etc., "the worth of the space program, in terms of economics, political, and social values, has been judged and found wanting by large numbers of the public and their representatives in government." Examines some of the factors behind this judgment, with emphasis on the failure to "sell the practical benefits of the program" and an "ostrich-like, head-in-the-sands approach to some of NASA's planning." "Even when a Vietnamese settlement takes place. . .funds will not automatically flow into the space program. The backlog of demands in other areas will have increased, not diminished". Predicts a "fairly level plateau for the next few years" in space funding.
[Rep. Karth is a member of the House Committee on Space Science and Astronautics, Chairman of the Subcommittee on Space Science and Applications, and a member of the Subcommittee on NASA Oversight].

33. Morgenstern, O., "The Worth of the Space Program: Economics", Communication made at the meeting of the American Institute of Aeronautics and Astronautics, Anaheim, California, October 27, 1967, 23 pp.

Discusses the general difficulties of choosing from among incommensurable goals (e.g., space research, slum clearance, abolition of poverty), and then examines some of the economic consequences of the space program: the "consequences of spending annually about $5 billion" including its various multiplier effects ("this whole aspect is only of indirect value for an appraisal of the results of the space program"); the byproducts of the program, such as new devices, new materials, etc. ("that NASA finds it worthwhile. . .to emphasize such matters indicates that there is great uncertainty about payoffs, that they are looking at the wrong things and have no. . .better case for the space program"); the "direct impact on the economy ("This is an area for truly significant economic studies which, I suspect, will reveal payoffs that are very respectable even when considering the tremendous investments made"); and important scientific results (modest so far, but probably much more significant in the future).

34. Normyle, W. J., "NASA Pushes Planetary Program", Aviation Week and Space Technology, v. 87, no. 22, November 27, 1967, pp. 16-17.

"National Aeronautics and Space Administration hopes to convince President Johnson that U. S. interplanetary exploration plans for the 1970's still can be salvaged with modest reprogramming in the Fiscal 1968 budget. NASA is willing to sacrifice portions of the Apollo Applications Program to reinstitute planetary efforts that unless reprogramming is approved will halt by 1970."

35. Von Braun, W., "Space Prospects Before the Space Age Began--And Today", Astronautics and Aeronautics, v. 5, no. 10, October 1967, pp. 44-49.

Reviews the origins of the U. S. space program, states the requirements of a sound program (scientific underpinning, specific goals to be reached within a definite period of time, and adequate funding), describes the government agencies and committees that take part in the making of decisions and policies regarding the space program and reviews their recent recommendations as to the future of the program. Concludes that "the outlook today for the continued exploration of space is not bad" but that there is a danger of apathy, and that "we must continually set new goals that will challenge the human spirit".

36. Watkins, H. D., "SST Sets Precedents in Fund Recovery", Aviation Week and Space Technology, v. 87, no. 16, October 16, 1967, pp. 44-53.

A detailed description and explanation of the government-industry funding arrangement for the supersonic transport program, including the positions of the critics and supporters of the funding scheme. Secretary of Transportation Boyd calls it "a prime example of how business and government can together achieve the goals of the nation; Senator Monroney notes that the scheme "'could be a new step in joining government and business together' to take on major programs"; others "caution that its problems and solutions may give it a peculiar quality not applicable elsewhere", and others are critical of the solutions reached.

V SCIENCE, EDUCATION, AND THE UNIVERSITY

18. "Academia to Have Its Say on Federal Influence", Scientific Research, v. 2, no. 10, October 1967, p. 15.

    Formation of an HEW-sponsored committee to study government-university relations in the areas of higher education and research, and to make recommendations on: communications between university administrators and the government, physical facilities grants, project grants, block or institutional grants, scholarships and student loans, and fiscal and taxing devices.

19. "Classified Research in the University", Bulletin of the Atomic Scientists, v. 23, no. 8, October 1967, pp. 45-46.

    Statement by the Federation of American Scientists on classified research in the university.

20. "NASA Faces 'Drastic' University Program Action", Washington Science Trends, v. XIX, no. 6, November 13, 1967, p. 32.

    An address by James E. Webb at the University of Illinois titled "NASA and the Universities". The space agency's fiscal 1968 budget cuts will bring about a "redefinition of university support programs; the "agency has set up a special task force to recommend 'least harmful' methods of coping with the budgetary crisis with the goal of easing the impact on universities and conserving 'our hard won gains'". Because of the "step-funding" policies of NASA "the effects of reductions will be spread over more than one year, and. . .graduate fellows will be able to complete their work even if new training grants are sharply reduced or cut off entirely".

21. "Science Policy School", Industrial Research, v. 9, no. 12, November 5, 1967, pp. 20-21.

    Purdue University is establishing a program "to turnout masters and doctorates in political science with an emphasis on science and public policy"; assistance is being provided through a two-year NSF grant of $130,000.

22. "Systems for Measuring and Reporting the Resources and Activities of Colleges and Universities", National Science Foundation, NSF-15, 1967, 444 pp.

    This detailed study, funded by NSF and NIH, is designed to assist institutions of higher education in developing uniform procedures of financial analysis and record-keeping.

23. "University Curricula in the Marine Sciences", Academic Year--1967-68, ICO Pamphlet No. 30, prepared by Interagency Committee on Oceanography, for National Council on Marine Resources and Engineering Development, Washington, D. C., August 1967, 157 pp.

A compilation of marine science courses offered at American colleges and universities, with separate listings of curricula in ocean engineering and marine technology, typical program requirements, and financial assistance programs to students.

24. "50 'Themis' Projects", Industrial Research, v. 9, no. 11, October 5, 1967, p. 19.

Project Themis was announced in January 1967, as a DOD-sponsored program to develop new "centers of excellence" at universities for research in defense-related areas. Since than, 173 universities have proposed 480 projects; 50 of these projects, costing $20-million, have been selected for support with '67 fiscal year money and another 50 will be selected in '68. Some university objections to the program were due to a misunderstanding of the funding scheme. The "plan permits a university to commit itself to three-year efforts if it staggers the project starts, and all of the funding would be supplied by the Pentagon."

25. Carlson, E. "Scholars and Secrecy", The Wall Street Journal, v. XLVIII, no. 8, October 25, 1967, p. 1, col. 1, and p. 13, col. 1.

The growing controversy over classified research at universities, is spurred by the opposition "to the Vietnam war and to war-related research" as well as the "increasing faculty concern that classified contracts may curtail a scholar's traditional obligation to disseminate his research findings". This report discusses the position and action of some universities, presents the government's views, and points to some organizational mechanisms for getting around the problem.

26. Carroll, J. D., "The Process Values of University Research", Science, v. 158, no. 3804, November 24, 1967, pp. 1019-1024.

Distinguishes the produce values of research (value of the information produced to federal agencies, scientists, and to the public) from its process values (the values of the activity of research itself to the people performing the research and to the university and the locality in which it is performed), and describes the two sets of values. Notes examples of new programs that reflect the process values in government-university policies, and examines the several social and economic trends underlying this development. Discusses the two patterns of science administration and policy making associated with the two sets of values: the advisory group/agency/appropriations subcommittee pattern as the mechanism for handling project grants, and the interest group/investigation and authorization committee as the mechanism for handling institutional programs and grants. Recommends measures for reconciling the two sets of values and patterns in a comprehensive policy for federal support of university research.

27. Foster, J. S., Jr., "On the Relationship Between the University and the Department of Defense", Department of Defense Statement, November 2, 1967, 3 pp.

A statement by the Director of Defense Research and Engineering, DOD, presenting "the reasons for DOD needs for research. . .basis for believing that defense and academic research objectives are compatible. . .funding data comparing the DOD position with other Federal agencies as sponsors of university research. . .the issues related to security classification and reviews of publications." Under this new policy, "all basic research supported by DOD at universities will be unclassified. However,. . .we will continue to support a very small number of exploratory development and study efforts at universities, as well as occasional consulting arrangements."

28. Green, H. P., "The AEC Proposals - A Threat to Scientific Freedom", Bulletin of the Atomic Scientists, v. 23, no. 8, October 1967, pp. 15-17.

Proposed new AEC regulations are described and their consequences examined. One consequence "will be to subject private research in these areas to severe security impediments and to AEC's veto and control. This includes research in fields unrelated to atomic energy but which may develop information usable in the technologies specified within the categories of private restricted data." The "proposed regulations would represent the first effort ever made by the federal government to prohibit or control the flow of information and the private conduct of research." "It is a noteworthy, even remarkable, fact that individual scientists, the scientific community, and the universities. . .have greeted the proposed regulations with apathetic silence."

29. Hechinger, F. M., "New Financial Squeeze for Colleges", The New York Times, November 5, 1967, p. 9.

The inflationary spiral of college operating expenses, the impending reductions in Federal research funds, and the current policy of deferring appropriated funds are threatening the survival of some institutions, particularly private ones. Some specific public subsidy may be required to fill the financial gap.

30. Krieger, K. A., "Universities Must Engage in Secret Research", Industrial Research, v. 9, no. 11, October 5, 1967, pp. 87, 90-92.

The argument for classified research by the director of the germ and biological warfare programs that were the focal point of the recent controversy at the University of Pennsylvania over secret research: argues that the state of the world justifies such research, that national security justifies its secrecy, that scientists should "consent to become involved in 'classified' research, and that research on biological and chemical warfare is not illegal under international law.

31. Mildvan, A. S., "Secret Research Has No Place in a University", Industrial Research, v. 9, no. 11, October 5, 1967, pp. 87-89.

The argument of the principal opponent to classified research in the recent University of Pennsylvania controversy over two secret germ and chemical warfare programs: argues that secret research is contrary to university policy, professional ethics, and possibly international law (in the case of germ and chemical warfare research), and that its conduct is harmful to the professional conducting it, the university, and the project itself.

32. Vallance, T. R., "The Government-University Relation in Social Science: A Review of Some Issues", American Behavioral Scientist, v. 10, no. 10, June 1967, pp. 28-32.

Enumerates some of the facets, purposes, and values of government, universities, and social science, and discusses the implications for government-university relationships and issues which can arise in the pursuit of social science research. Concludes that the "maximum mutual benefit from the association" between the federal government and the universities "is not yet realized and that much exploration with various administrative forms must be attempted together" in order to achieve this benefit; and "of central concern. . .is a mutual understanding of the role of publication and information exchange".

33. Wenk, E., Jr., "The Engineer and the Public Interest", speech before the General Session, Winter Annual Meeting, American Society of Mechanical Engineers, Pittsburgh, Pennsylvania, November 15, 1967, 20 pp.

Reviews some characteristics of this era (e.g., war and peace, population explosion, pollution, dominant government role in R&D), and notes that our "society does not seem to appreciate that our wealth now permits us to make collective political decisions necessary to apply science and technology effectively to our major social problems"; discusses the "social unconcern of a profession that has been satisfied to produce the hardware and leave to others the consequences", the need for utilizing "science and technology in the broad public interest", and the lack of appropriate academic training of engineers for dealing with the social consequences of technology; recommends a reshaping of engineering education to anticipate and meet the needs of society, greater student education support from civilian agencies and less from DOD, NASA, and AEC.

VI SCIENCE MANAGEMENT AND POLICY-MAKING BODIES

26. "Better Management of Research Equipment Procurements and Utilization in Federal Laboratories", U. S. House of Representatives, Committee on Government Operations, Ninetieth Congress, First Session, Washington, D. C., October 1967, 15 pp.

This study, prepared by the Research and Technical Programs Subcommittee, discusses the cost of research hardware, and reviews procedures used for procuring some types of equipment, the use of elapsed-time meters to establish equipment utilization, the "walkthrough" technique for identifying idle equipment, and the use of equipment pools. Recommends the use of such techniques and further studies to identify problems and to learn of "any management innovations which could be adopted on a Government-wide basis".

27. "NSF Charter Changes Would Better Define Its Role", Chemical and Engineering News, v. 45, no. 50, November 27, 1967, pp. 12-13.

Pending bills, one from the House and the other from the Senate would define more clearly NSF's role in support of science (e.g., specifically authorize NSF to support the behavioral and social sciences, and applied research), would streamline and redefine NSF's internal structure for smoother administration, and would require NSF to assume a somewhat more appraising role as to resources, status, and health of science. The proposed charter changes are broadly supported, with a preference for the Senate bill, although some concern has been expressed over the inclusion of applied research.

28. "R&D Unrest Aids Nuclear Probe", Industrial Research, v. 9, no. 13, December 5, 1967, p. 13.

A Federal Committee on Nuclear Development is proposed by Congress to "review and re-evaluate the existing civilian nuclear program of the United States". The proposed panel would consider and assess: the impact of a subsidized atomic energy industry on nonsubsidized competitors; the cost of the program in human and material resources; methods for integrating atomic energy into the rest of the energy complex; and the potential impact of rapid development of atomic energy on health and safety. There was little support for this proposal "until the House began its drive to cut spending and singled out R&D as a promising target."

29. "Science Adviser Hornig Discusses His Job", Chemical and Engineering News, v. 45, no. 50, November 27, 1967, pp. 28-29.

Hornig reviews and appraises his efforts in connection with the "state of the nation's colleges and universities", the space program, and military-defense science and technology, and comments on the new kinds of problems which are demanding more and more of his attention:

international cooperation through science, "technology gaps", economic development, food supplies for expanding populations, water and air pollution, and energy policy problems. In commenting on the currently harsh treatment of R&D budgets, Hornig believes that "Congress definitely has developed much more of a show-me attitude toward science and technology"; however, he believes that the current actions of Congress regarding R&D are merely "an attempt to economize generally in the face of a large budget deficit.

30. "Technological Innovation: Its Environment and Management", U. S. Department of Commerce, U. S. Government Printing Office, (0-242-736), Washington, D. C., 1967, 83 pp.

The report of a panel of private citizens convened by the Secretary of Commerce to discuss means by which the government can improve the climate for technological change. Antitrust legislation, taxation, patents, and the regulation of industry were some of the measures considered.

31. "The Administration of Research Grants in the Public Health Service", U. S. House of Representatives, Committee on Government Operations, Ninetieth Congress, First Session, Washington, D. C., October 1967, 113 pp.

A highly critical indictment of NIH's administrative policies and practices for research grants, including "excessive indirect cost payment to grantees", lack of uniformity of practices, failure "to obtain compliance with many of its grant policies", declining quality of research, the use of "a small group of individuals for long periods on advisory councils", and "unusual cost-sharing agreement with a large research institute", the use of an "irresponsible" and "unscientific" procedure for initiating the Health Sciences Advancement Award program, its "surprisingly casual" administration of the General Research Support program, and the continued high concentration of PHS grants in a small number of institutions. A strong set of recommendations, including revisions, is offered to the Public Health Service Act.

32. Utilizing R&D By-Products, edited by Jerome W. Blood, American Management Association, Inc., New York, 1967, 127 pp.

This book consists of several articles dealing with enhancing the use of R&D by-products ("spin off", "fallout"). Discusses the questions of the effectiveness of the research industry in this area ("only 30 percent of the useful technology generated today is actually utilized"), of how to capitalize on by-products, the sources of research products, the factors that inhibit greater utilization of research by-products, and approaches to increase utilization.

33. Greenberg, D. S., "Money for NSF: The Odyssey of a Research Agency's Budget", Science, v. 158, no. 3799, October 20, 1967, pp. 357-361.

The "political odyssey" of NSF's current budget "from the National Science Foundation, to the White House, to Congress, to Cambridge, Massachusetts, and back to Congress" reveals "a good deal about the contemporary politics of science": the budget is based on "the administration's response to congressional practice and preference, rather than" on "any carefully formulated research policy or master plan"; the Mohole program is still remembered by some in Congress; "NSF has a large and influential constituency throughout the country, but heretofore has generally failed to enlist its assistance"; Cambridge "remains a powerhouse of science politics"; some Senate support for the administration budget is based on the expectation that "more of NSF's largesses would be dispatched to institutions in their states" - "they weren't voting money for science for the sake of science".

34. Lear, J., "Science vs. Democracy: The Developing Struggle", Saturday Review, November 4, 196 , pp. 57-61.

Quotations from and comments on the recent Fountain subcommittee report dealing with NIH grants, with emphasis on the noncompetitive nature of certain grants, the lack of close review, and policy implications.

35. Miller, A. L., "Management and the Natural Sciences", Research Management, v. X, no. 5, September 1967, pp. 309-320.

A discussion of R&D productivity and means for enhancing returns: provides numerical examples of increasing R&D costs and decreasing productivity, discusses some of the factors involved in and approaches to improving R&D, and describes an approach, based on the method of inquiry in the natural sciences, that is now being used in Israel.

36. Polanyi, M., "The Growth of Science in Society", Minerva, v. 5, no. 4, Summer 1967, pp. 533-545.

Discusses some of the tacit principles on which science is founded, and their significant bearing on science policy; concludes that progress in science requires that the "initiative to scientific inquiry and its pursuit must be left to the free decision of the individual scientist", and that the assessment of scientific value can only be performed by the scientific community.

VII SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE

27. "Brain Drain and Brain Gain: A Bibliography on Migration of Scientists, Engineers, Doctors and Students", Research Policy Program, Lund, Sweden, 1967, 48 pp.

This bibliography contains 415 items from 40 countries.

26. "Increase of R and D Funds" (Japan), The Science of Science Foundation Newsletter, v. II, no. 4, October 1967, p. 7.

"Public controversy arising from the acceptance of research funds by Japanese academic scientists from U. S. military sources has led the Japanese government to increase its support of science from 4.1-million to 10-million pounds. "University salary increases are also planned". "Determined to avoid a similar controversy the Science Council of Japan is currently studying a plan proposed by the Soviet Academy of Sciences, for joint research in the Sea of Japan. The cost will be borne by the Russians".

29. "Reversing the Brain Drain", Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, pp. 61-62.

"The Ministry of Technology is sponsoring a sustained drive to attract British and American engineers, managers and scientists from the United States to work for British companies." The effort is being run by two management consultant firms from a budget of about 80,000 pounds.

30. "The Brain Drain", Her Majesty's Stationery Office, London, England, Cmnd. 3417, October 1967.

This report to the Ministry of Technology, (prepared by the Working Group on Migration of the Committee on Manpower resources for Science and Technology) shows that the outflow of engineers and technologists has more than doubled over the last six years and, in the case of the U. S. and Canada, has more than quadrupled. In numbers, emigration has risen from 3,200 in 1961 to 6,200 in 1966; taking into account those who returned, the net loss was still 2,700 in 1966. Recommendations to combat the drain include: an effort to recruit engineers, technologists, and scientists in North America for British industry; greater job mobility within the U. K., a greater role for scientists and engineers in industrial management and policy making, a redirection of university education from the academic to the needs of industry, and improvement of management practices and management attitudes to highly qualified manpower. [For British reaction to the report, see New Scientist, v. 36, no. 567, October 19, 1967, and The Engineer, v. 224, no. 5830, October 20, 1967]

31. "The Influence of Science and Technology in Present Day Foreign Policy", Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, pp. 47-48.

An analysis of the interaction of science and foreign policy in industrialized nations, by Manfred Schreiterer, a member of the German Delegation to the OECD. "Nowadays foreign policy, economic policy, military policy, and science policy" are interdependent; "numerous examples of the important role of science and technology in modern foreign policy" are given (e.g., French agreement on technical cooperation with Eastern European countries, and the acceptance by the Soviet Union and others of the French color television system); "Could not Germany's old-established reputation in science and technology be used to bring about a political détente with her Eastern European neighbors?" "Conversely, foreign policy could influence certain aspects of science and educational policy, for instance, the determination of scientific priorities", and the "problem of scientific and technological disparities" has "become one of the principal preoccupations of foreign policy".

32. "The Need for European Co-operation in Research", Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, pp. 42-44.

"At the Annual Meeting of the Max Planck Society in June 1967 Professor Adolf Butenandt, in his presidential address, discussed international cooperation in scientific research and technology and its implications for the organisation of research in the Federal Republic". Topics included: the rising costs of research and the political considerations and measures needed; the relative strengths in R&D of the U. S. and the Common Market countries, and the bases for the favorable U. S. position; European scientific cooperation as necessary to keep pace with the U. S.; loosening of present funding procedures from the current 1:1 ratio between the Federal and "Länder" governments ("otherwise scientific progress would be determined by the financially weaker party").

33. The United States--Japan Committee on Scientific Cooperation, Department of State Publication 8210, East Asian and Pacific Series 158, International Scientific and Technological Affairs, U. S. Government Printing Office, Washington, D. C., 1967, 70 pp.

A report on the activities and accomplishments during the first five years of the program. The program focuses on exchange of scholars, scientific information, and materials, and on the pursuit of joint research projects. The latter includes: earth and atmospheric sciences of the Pacific, animal and plant geography and ecology of the Pacific area, biological and medical sciences, education in the sciences, hurricane and typhoon research, and research on pesticides. Includes a description of research projects and resulting publications.

34. The Rise and Fall of Project Camelot, edited by Irving Louis Horowitz, MIT Press, Boston, 1967, 376 pp.

Project Camelot was described officially in 1964 as "a study whose objective is to determine the feasibility of developing a general social systems model which would make it possible to predict and influence politically significant aspects of social change in the developing countries of the world." About one year later the project created an uproar in academic and political (national and international) circles when the Chilean government named the project as a cover for spying and subversion. This brought on a Congressional hearing, a State Department censure (and subsequent regulations regarding overseas research) and an abrupt termination of the project. This book is an assembly of the viewpoints of social scientists and statesmen who were involved in the project and its uproar, and an analysis of the events and their implications.

35. Beals, R. L., "Cross-Cultural Research and Government Policy", Bulletin of the Atomic Scientists, v. 23, no. 8, October 1967, pp. 18-24.

"Anthropologists have been able to do research in foreign areas because of their reputation for autonomy and disinterestedness. . . Now the reputation. . .has been compromised, and foreign countries increasingly find anthropological research to involve sensitive subjects. . .". Comments on Project Camelot, classification of anthropological research, the Foreign Affairs Research Council within the Department of State, and on the making of decisions "about the use of social sciences and social scientists within government . . .without the advice or even the knowledge of the professional members of the disciplines." "Social scientists need to solve the problems of being in a national segment of an international culture and to reconcile these with the demands of the academic world and needs of the. . .government. . . And government needs to learn how to use social science effectively without destroying the integrity and productivity of the various disciplines."

36. Boffey, P. M., "Research in Japan: U. S. Army Grants Cause Controversy", Science, v. 158, no. 3802, November 10, 1967, pp. 748-752.

U. S. Army research grants to Japanese scientists has created a heated controversy in Japanese university and government circles. This has led to new Japanese regulations for accepting grants that threaten NIH's program in Japan (over $850,000 in 1967) in medical and biological research.

37. Crawford, E. T., and Lyons, G. M., "Foreign Area Research: A Background Statement", American Behavioral Scientist, v. 10, no. 10, June 1967, pp. 3-7.

A description of "how social science research in foreign affairs has developed within the government in the past 25 years" and a discussion of the issues, problems and tensions that it has created, with respect to (1) the status and priorities in foreign area research, (2) the conduct of field research, and (3) the coordination and utilization of research findings.

38. Fink, D. E., "World Unity Urged on Space Programs", Aviation Week and Space Technology, v. 87, no. 14, October 2, 1967, pp. 21-22.

A proposal for "future global cooperative space programs" made at the 18th Congress of the International Astronautical Federation. The proposal calls for the leading space powers to begin by "increasing the coordination of mission objectives in their national space programs", followed by the establishment of "an international organization to plan and coordinate advanced manned missions in the 1980's". "If we don't get international cooperation going in a big way in the next five years, we will begin to see a reduction in space activity in all countries". Presents estimates of the costs and personnel ($4 billion and 350,000 persons) of the proposed program and lists missions that would be possible under the international effort.

39. Greenberg, D. S., "Social Sciences: Expanded Role Urged for Defense Department", Science, v. 158, no. 3803, November 17, 1967, pp. 886-887.

Previews a document titled "Report of the Panel on Defense Social and Behavioral Sciences", prepared by the NAS for DOD, which examines "High Payoff R&D Areas", "Research to Solve Manpower Problems", "Project Themis", and "Government/University Relationships", and recommends that DOD "increase its support and use of research in the social and behavioral sciences".

40. Parsons, E., "International Technical Co-operation: Evaluation and Perspectives", OECD Observer, no. 29, August 1967, pp. 3-9.

An appraisal of the technical aid effort by the Director of the OECD Development Department. Discusses the reasons for the failure of the "massive, expanding aid effort which some expected at the beginning of the 1960's" to develop, reviews the favorable trends, the "technical co-operation relationship, and the needs and perspectives in this area. Concludes that the next decade will see increasing importance attached to human resources in the development process, that the mechanisms and expertise required to mount effective co-operative efforts now, generally speaking, exist and that the difficulties in meeting the needs are in manpower, rather than in money.

41. Seaborg, G. T., "The Promise of the International Atomic Energy Agency", Science, v. 158, no. 3798, October 13, 1967, pp. 226-230.

Description of IAEA's program in nuclear power, desalting of seawater, radioisotopes and radiation, medical research and services, and basic research. "The IAEA represents. . .one of the most significant and promising developments. . .in international relations--the emergence of science and scientists as an important factor in the determination and execution of national policy."

42. Skolnikoff, E. B., "Birth and Death of an Idea: Research in Aid", Bulletin of the Atomic Scientists, v. 23, no. 7, September 1967, pp. 38-40.

An informal case study of the people, forces, and circumstances involved in initiating and frustrating the development of a research program in AID.

43. Sturm, T. A., The USAF Scientific Advisory Board, Its First Twenty Years, United States Air Force Historical Division Liaison Office, U. S. Government Printing Office, Washington, D. C., 1967, 194 pp.

An official history of the Scientific Advisory Board from its inception in 1944 to 1964, including the titles of its studies and special reports.

44. Thomas, B. "The International Circulation of Human Capital", Minerva, v. 5, no. 4, Summer 1967, pp. 479-506.

A comprehensive study of the international "brain drain", including a summary of the available statistics, and economic analysis of the welfare effects of the "brain drain", its relationship to economic growth policies, and the present and future professional skills market in the private and public sectors. Concludes that the U. S. may attract even larger numbers of scientific and technical immigrants, that its immigration policies abet such immigration, and that the flow of such immigrants into the U. S. may inhibit the "realization of other countries' growth policies".

45. Torpey, W. G. "The Impact of Defense Cutbacks on Engineering Manpower", Engineering Education, v. 58, no. 3, November 1967, pp. 227-229.

This article points out the role of engineers in the national defense effort, calls attention to the prospect of change in this effort, sets forth selected findings and recommendations from a series of research projects dealing with the impact of defense cutbacks upon engineers, and urges that careful consideration be given and appropriate action taken now with respect to the adoption of measures to strengthen the engineering employment adjustment process in anticipation of, and during future defense changes.

VIII SCIENCE POLICY IN FOREIGN COUNTRIES

30. "Annual Meeting of the German Research Association", Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, pp. 39-41.

At the annual meeting in July 1967, Professor Speer, the President of the Association, advised "scientists to make every effort at rationalization and co-ordination within their respective fields; he warned. . .that only flexible methods of research promotion could safeguard federal principles in this respect"; he asked the "Federal Government not to relent in its efforts towards generous research support". Speer also asked for greater flexibility in the financing procedure of the Association. The Federal Minister for Scientific Research, Dr. Stoltenberg, called for cooperation and distribution of tasks among the major institutions (e.g., the German Research Association, Max Planck Society, independent research organizations, and the Federal Government) in promoting science. "The Government was anxious for German research to reach and maintain internationally recognized standards, particularly in fields such as nuclear research, space research and data processing. For this reason, the Government had given scientific research a clear priority in its medium-term financial planning, with considerable rates of increase, despite its acute financial worries." "In doing so, however, it had assumed responsibility for the optimum and rational utilization of the means" for attaining the objectives.

31. "German Goal: 3% GNP", Industrial Research, v. 9, no. 13, December 5, 1967, p. 17.

The Science Minister of West Germany recommends that German R&D expenditures be increased to 3% of the GNP by 1970, in order to close the technology gap in such fields as environmental heth, materials, energy conversion, pollution and noise control. As a further step in strengthening its scientific research, the governmental and private agencies are urged "to band together in a research federation to coordinate R&D efforts and stretch available funds and manpower". Significant increases in funding for space research and electronic data processing capability are also planned.

32. "Organisation for the Advancement of Pure Research Annual Report for 1966", Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, pp. 50-52.

This organization, which is financed by the Netherlands government, is responsible for promoting and coordinating all basic research. The report presents the funding pattern for 1966 by scientific fields; physics receives over 50 percent of the funds, astronomy 10.7 percent, the life sciences 10.5, and chemistry 10.4 percent.

To "maintain its scientific activities at their present level will necessitate an increase in its annual expenditures of 11.6 percent. In 1966, however, its expenditures rose by 10 percent only, and for 1967, an increase of 5 percent is expected".

33. "Organization of Ministry of Technology", Nature, v. 216, no. 5117, November 25, 1967, pp. 745-746.

A description of the organization and functions of the U. K.'s Ministry of Technology, supplied by its Permanent Secretary.

34. "Policy Conference on Highly Qualified Manpower", reported in "Science Policy Information 3", Organisation for Economic Co-operation and Development, no. 22913, October 1967, pp. 7-15.

A collection of studies dealing with the problems and policies of training and utilizing technical personnel, including studies on "the careers of scientific and technical personnel" and "technology gaps between countries".

35. "R and D Cost-Benefit Study", The Science of Science Foundation Newsletter, v. II, no. 4, October 1967, pp. 2-3.

"The recently established Manchester Business School will study how and to what effect we spend our money on research and development. A sample of British companies will be evaluated on their research and development methods and some measure of effectiveness produced. A second, national investigation will look at particular cases of innovation and measure potential benefits, past and prospective, in an effort to elucidate the important factors. The U. K. Atomic Energy Authority and the Ministry of Technology will contribute up to 95,000 pounds for the four-year study."

36. "Recommendations by the German Science Council for the Development of Universities up to 1970", Organisation for Economic Co-operation and Development, Science Policy Information 3, No. 22913, October 1967, pp. 36-38.

The Council report surveys university developments since 1960 in regard to students, teaching staff, finance, building projects, etc., and recommends "at least 1793 new places, including 142 new chairs and 308 senior lectureships", "new buildings costing DM 5.6 billion, and the concentration on given scientific areas "rather than cling to the principle of universality".

37. "Science Council of Canada: First Annual Report, Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, pp. 22-23.

The report, published in June 1967, presents an overall review and appraisal of the state of science in Canada, and plans for further studies of special science fields and of support of research in universities.

38. "Scientific and Industrial Research Budget", Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, p. 53.

The 1967 budget of the Royal Norwegian Council for Scientific and Industrial Research is 130-million kroner (about $18-million) of which about $12-million comes from "Government grants, income from football pools, levies, etc." Efforts are planned to "relate research activities more closely to the needs of industry".

39. "Second Report on Science Policy, Her Majesty's Staticnery Office, London, England, Cmnd. 3420, October 24, 1967.

This report by Britain's Science Policy Council is more cautious than the first and reflects the realities of Britain's current economic state. (The Council advises the Secretary of State for Education and Science, which controls a major part of Britain's civilian science). The report gives considerable attention to rationalizing the support of science on the grounds of its contribution to economic growth, its role in producing new and needed scientists and technologists, and as "one of the main driving forces of civilization"; presents detailed plans for the growth and distribution of expenditures; recommends funding increments of 10 and 9 percent, respectively, for the two succeeding years; emphatically rejects the proposal to shift scientific manpower from research activities into technology; endorses the recommendation that Britain participate in the proposed CERN program for a 300-Bev proton synchrotron; takes a cautious line on space research; and reports on various other programs (e.g., computers in universities, biological research, Antarctic Survey). [For a British appraisal of the report, see Nature, v. 216, October 28, 1967, pp. 315-317, and pp. 322-323.]

40. "Second Science City", Industrial Research, v. 9, no. 13, December 5, 1967, p. 17.

The Soviet Union has announced its plans to construct another new R&D center near Akademgorodok (the Siberian center of scientific research) with the "goal of shortening the time lapse between a discovery and its industrial application from the present 10- to 15-year period to three to five years".

41. "Seven-Year Plan" (Japan), The Science of Science Foundation Newsletter, v. II, no. 4, October 1967, p. 7.

The International Trade Ministry and the Agency of Industrial Science and Technology propose to increase R&D expenditures from the current 1.9 percent of GNP to 2.5 - 3.0 percent. Sale of Japanese 'know-how' in 1965 brought in 4.6 million pounds compared with the 59 million that Japan spent on the purchase of foreign technology. "This balance of technology payments of 13:1 compares badly with West Germany's 2.3:1, Italy's 4:1, and 1.8:1 for France. The figure for the US is 1:10. The plan is seen as a long term attempt to reduce this gap".

42. "Short of Science Funds, India Pares Basic Research", Scientific Research, v. 2, no. 10, October 1967, p. 25.

Indian research priorities are changed from the present 50:50 ratio of basic and applied research to 80:20 favoring applied, with emphasis on "boosting farm output, checking the population explosion, and developing substitutes for imports".

43. "Survey of Scientific and Industrial Research in Denmark", Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, p. 26.

The Council for Scientific and Industrial Research reports the expenditures for research (excluding defense and atomic energy) in 1965 as $47.3-million, with approximately 50 percent spent in "business enterprises" and about 25 percent in universities.

44. "The Belgian National Council for Scientific Policy: Annual Report for 1966", Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, pp. 20-21.

Reports the Council's activities, Belgium's science policy, personnel and expenditure for science in 1965, the national science budget, and scientific institutions. Recommendations include raising the research budget to 2.15 percent of the GNP--3.42 percent of the government budget--by 1972, which would amount to approximately 350-million dollars (at current exchange rates).

45. "The Research and Development Drive in French Industry in 1965", Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, pp. 30-32.

A statistical survey of the resources devoted to R&D in French industrial enterprises. Results show a 6.5 percent increase from 1964 to 1965 in R&D personnel employed, and a predicted further increase of 5.7 percent for 1966. R&D expenditures increased from 1,950-million francs in 1960 to 4,700-million in 1965, and showed a 11 percent increase from 1964 to 1965. In 1965, 36.5 percent went to research and 63.5 percent for development.

46. "The Task of German Industry in the Context of an Up-to-date Research Policy", Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, pp. 45-46.

This report by Dr. Joachim Hennenhofer, on behalf of the Federation of German Industries, examines the areas where research results would be of the greatest benefit to the country as a whole, the sectors of R&D requiring systematic government support, the criteria to be applied in their selection, and the tasks facing German industry in this connection. Provides an extensive analysis of Germany's present research policy and how it is likely to change, and recommends that industry show a greater interest in these policy matters because of the increasingly closer relation between R&D and economic activity.

47. "Two Kinds of Scientists in China: Maoists Do Well", Scientific Research, v. 2, no. 10, October 1967, pp. 71-72.

Young Mao-oriented scientists doing research in fields that Peking wants to develop are in positions of increasing authority and prestige, while others are "under incessant pressure to be converted to. . .the Maoist line, and urged to do 'more constructive' research", according to Japanese scientists who have recently traveled in China. Includes a brief description of the organization of science, with estimates of the number of scientists and engineers, and reports (1) a severe shortage of assistants, technicians, and laboratory instruments, (2) an emphasis on research projects connected with defense and modernization, and (3) priority on physics and chemistry, and a relative neglect of the life sciences.

48. "The 1967 Budget of the German Federal Ministry for Scientific Research", Organisation for Economic Co-operation and Development, Paris, France, Science Policy Information 3, No. 22913, October 1967, pp. 33-34.

The 1967 budget of DM 1,675.9 million is 25.1 percent higher than the '66 budget, with DM 803.3 (up DM 182.9 over '66) for the "general promotion of the sciences", DM 570.8 (up DM 91.7 over '66) for "nuclear energy research and application", and DM 286.0 (up DM 57.9 over '66) for "space research".

49. Beloff, M., "British Universities and the Public Purse", Minerva, v. 5, no. 4, Summer 1967, pp. 520-532.

Discusses the operation of the University Grants Committee and its infringement on university autonomy, the disadvantages of the "bloc grant" system for recurrent expenditure, and the need to minimize dependence upon public support.

50. Bergmann, E. D., "Technical Strength For A New Nation", Science and Technology, no. 72, December 1967, pp. 62-69.

Science policy in Israel, its development and rationalization, and lessons for other underdeveloped countries: each country must create its own science establishments and its own ways of using science and technology; education is the first task that a country has to undertake in becoming "modern"; "an enlighted government sees science as a political instrument"; a fallacy of aid programs is "that a country can be modernized by giving it nuclear reactors and steel mills"; "the public good demands that every good research scientist also participate in educating the young"; dependence on the advanced nations for science and technology "because of ignorance is intolerable for any country"; in Israel, the "expected fringe benefits in every field of scientific and technical endeavor have materialized"; and "every new nation should be pointing its initial atomic-energy work toward. . .the rationalization of agriculture, rather than just the production of electricity".

51. Christiansen, W. N., "Science and Scientists in China Today", Scientific Research, v. 2, no. 10, October 1967, pp. 64-68.

A general description of current science and science policy in China (the author was in Peking during 1966-67 advising the Chinese Academy of Science on the construction of a radio telescope). Conclusions include: China "no longer has to rely on any other country for any of its essential industry or scientific needs"; scientific instrumentation is modern; cultural revolution has had no effect on research; no areas of research are being neglected; science is viewed as "only one part of human activity" with no "special place in society" for scientists; and the pattern of technical education is changing rapidly with emphasis on "a mixture of study and productive work from the secondary schools onward".

52. Julius, H. W., "Scientific Policy in the Netherlands", Minerva, v. 5, no. 4, Summer 1967, pp. 507-519.

Traces the evolution of science policy in the Netherlands from the 1800's to the present, and describes the current institutional system of research including the advisory bodies. Discusses some of the shortcomings of the present system, and the need for a mechanism other than "judgment by peers" to set priorities at a time "when resources can no longer keep pace with the nearly explosive expansion of demands".

53. Long, T. D., "Science Policy in Japan", OECD Observer, no. 28, June 1967, pp. 32-37.

A summary of the OECD review and analysis of Japan's national policy for R&D, prepared by the rapporteur of the international group of experts performing the study. Presents data on the resources and expenditures devoted to R&D, describes the role of government, the tools of policy, government-sponsored research, and examines the major science policy issues currently confronting Japan. The latter are a set of "policy problems which might be called 'second generation' issues that center on the institutional roles of industry, higher education and government."

54. Odhiambo, T. R., "East Africa: Science for Development", Science, v. 158, no. 3803, November 17, 1967, pp. 876-881.

Describes the administrative structure for science in East Africa ("largely a legacy of the colonial interlude". . ."lack of coordination at a national level". . ."less coherent than. . .during the colonial period"), summarizes the main weaknesses of the administration, presents appropriations for different types of research, inventories scientific research personnel ("about 3000 trained research workers" in 41 independent countries of Africa), describes some of the new science teaching ventures, examines the cultural attitude and social philosophy of Africa that discourages "a tradition in science", and recommends a new science policy.

55. Price, D., "Science and Economic Growth", Chemistry In Britain, v. 3, no. 10, October 1967, pp. 433-436.

Recommendations for changes in the U. K.'s science policy aimed at enhancing economic growth: U. K. expenditure on R&D has been higher than in any other European nation, but its economy has grown slowest; discusses and defends military R&D; proposes a reduction of the present committee to a single advisory committee for civil science and technology under a single minister; suggests a greater role for industrial R&D and less for government research establishments, greater emphasis on profitability as an allocation criterion, and more scientists in management positions in both government and industry.

56. Trapeznikov, V., "The Efficiency of Science in the Soviet Union", Minerva, v. 5, no. 4, Summer 1967, pp. 546-552.

A general "position paper", by the Vice-Chairman of the State Committee of the Council of Ministers of USSR for Science and Technology, on the economic value of science (e. g., "each ruble invested in science. . .increases our national income by one ruble, 45 kopeks"), criteria for evaluating the work of research institutions, the need for greater "competition of scientific and technological ideas", the bottle-neck in technological innovation created by failure to apply research results, and the need to shift funding priorities from equipment and plant to R&D.

57. Varsavsky, O., "Scientific Colonialism in the Hard Sciences", American Behavioral Scientist, v. 10, no. 10, June 1967, pp. 22-23.

Distinguishes between "nationally oriented" and "colonialist" research, with the former referring to research aimed at solving "technical problems of special interest to the country concerned", while "colonialist research is motived by what the most advanced research centers of the world deem to be important, regardless of whether the country will benefit from it within the next century". Colonialist research dominates in South America: "our subject matters of research, methods, and theories are imported; our scientists look abroad for ideas and goals, communicate much more frequently with the foreign colleagues, and feel defeated when they cannot publish their results in foreign journals". It is proposed that developing countries "start choosing their own lines of research with an eye to national problems", and that a science policy reflecting and reinforcing national interests be devised to see that this line is followed.

58. Walsh, J., "ESRO: Space Sciences Research in Europe Suffers Growing Pains", Science, v. 158, no. 3798, October 13, 1967, pp. 242-243.

A discussion of the problems, progress, and prospects of the European Space Research Organization in which 10 countries are participating. "Fragmentation is a salient feature of Western Europe's space effort. In addition to national programs of varying size there are separate intergovernmental organizations for space sciences, launcher development, and satellite communications. Urgings toward unification, or at least rationalization, have been heard for some time".

59. Walsh, J., "Euratom: After 10 Years, Still Seeking the Way", Science, v. 158, no. 3797, October 6, 1967, pp. 95-98.

"For some time the news of Euratom, the atomic energy organization of Europe's 'Six,' has been gloomy. Budget difficulties, uncertainties about internal structure, and, most important, questions about the agency's mission have led many to take a pessimistic view of Euratom's future. However troubled the present, Euratom's functions are nevertheless too valuable to be written off, although its form may alter considerably from that envisioned when the organization was established a decade ago." "Euratom's experience proves, as much as anything, that its members are unready for real supranational cooperation, industrially as well as politically."