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ABSTRACT

This issue of Science Policy Reviews, a quarterly publication formerly titled the Science Policy Bulletin, presents 438 annotated bibliographic references from the current national and international literature in the area of science and public policy. For brevity, the word "Science" in the title of the Reviews is used to denote engineering and technology as well as science. The literature reviewed includes books, reports, and periodical articles, with regularly screened periodicals listed on the inside back cover. The focus of the literature reported is on matters of broad public policy; literature of a highly technical and narrowly specialized nature is not included. In addition to the bibliographic entries this issue includes two articles: Engineering and the Technical Society, a report of a conference of educators on the relationship of technology to society, and courses and curricula on the subject, including a list of over 70 courses at various colleges; and U. S. Energy Predicament, a review of the crucial problems posed by our seemingly incompatible requirement for more and more energy with less and less pollution. (Author/PR)

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Science

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# **e Policy Reviews**

**4 / THREE / 1971**

Science Policy Reviews (for reviews, highlights, and annotations of current national and international public policy. For brevity, the word Reviews is used to denote engineering and technology reviews.)

Science Policy Reviews is a quarterly journal of articles and discussions engaged in studying, formulating, and evaluating policy relating to science and its applications. The journal's content Reviews includes books, reports, and articles. Reviews of screened periodicals are listed in the journal. The literature reported is on major areas of science and a highly technical and narrowly focused area.

## Science Policy Reviews

Volume 4

Managing Editor

Editor

Circulation

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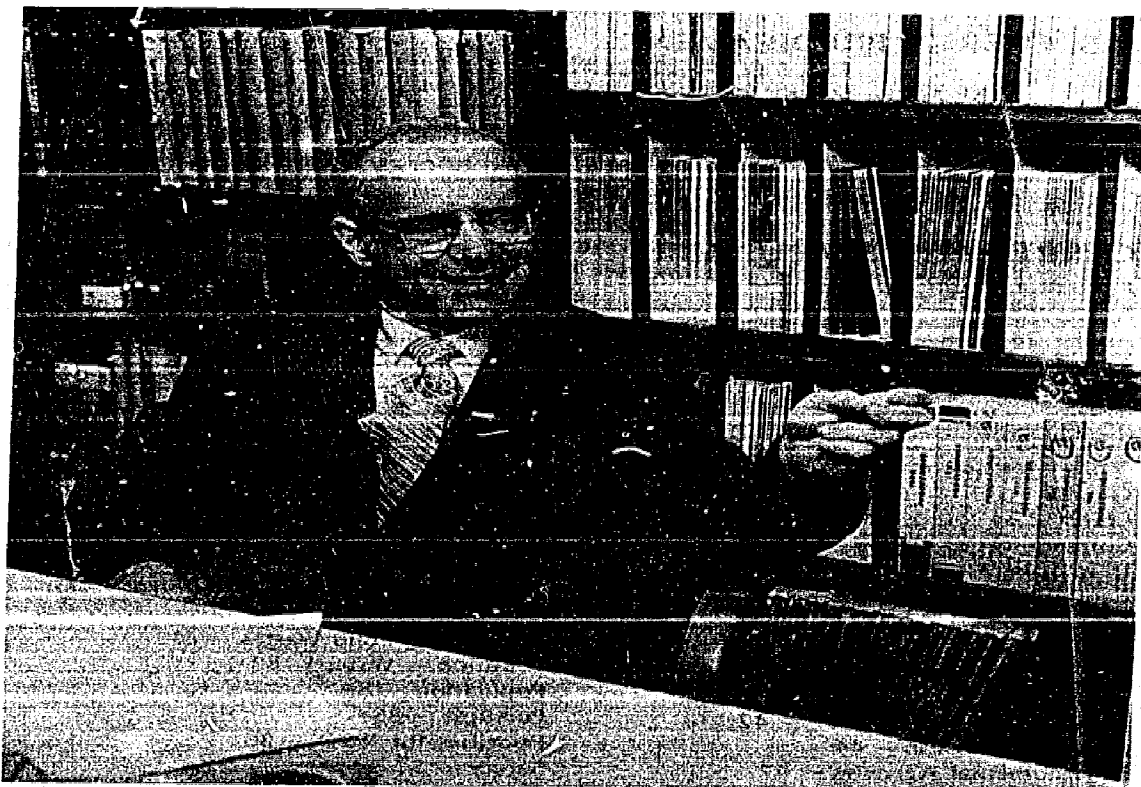
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## About This Issue

When you read a journal or a book, do you feel something is missing unless you know a little about the author or editor? Do you hunger for some information about his background and his experience, so that you may guess at his views and perhaps his biases? I know that I do. In this spirit, it seems appropriate to say a few words about your Editor, Eugene (Gene) M. Simons.



Visualize if you will a trim (155 pounds), medium height (5 feet, 10 inches) young man of 54. His multifaceted activities and schedule both demand and assure that he stays trim! Perhaps the above photo of Gene will aid your imagination.

Gene's commitment and dedication to the science of engineering has found expression in what at times has seemed like several careers — as a mechanical engineer, as a pioneer in nuclear engineering, and as an editor and writer. In addition to his responsibilities as Editor of *Science Policy Reviews*, he continues to devote considerable effort to reactor engineering research at Battelle's Columbus Laboratories. In both capacities, he draws upon more than 30 years of professional experience.

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Gene joined Battelle in 1943 after having served as an instructor in engineering at Marshall College (1938-40) and as an assistant professor of mechanical engineering at Virginia Polytechnic Institute in 1940-43. As preparation for his scientific career, Gene received his M.S. and B.S. degrees from Virginia Polytechnic Institute and Carnegie Institute of Technology, respectively. After joining Battelle, he earned his Ph.D. at The Ohio State University.

In his early years at Battelle, his research was heavily oriented toward mechanical engineering. He contributed, for example, to improving the performance of automotive brakes through the development of a valuable device for evaluating the behavior of friction material.

Shortly after World War II, Gene began a wholly new facet of his career — research in nuclear engineering. When controlled atomic fission for the production of electrical power was not yet a practical reality, he concentrated his efforts on the difficult task of transforming theoretical capabilities into practical hardware. He has worked on many facets of the materials problems of naval-propulsion, aircraft-propulsion, and stationery-power reactors, and his contributions in these areas are numerous.

Throughout his years of research, Gene has demonstrated a talent for coordinating, compiling, and presenting technical information. He is the author or coauthor of some 30 articles, papers, and book chapters. From 1956 to 1963, he was on the editorial board of *Wear*. For 14 years, beginning in 1956, he served as editor of the U.S. Atomic Energy Commission quarterly journal, *Reactor Materials*. Additionally, he served as editor of *Nuclear Reactor Plant Data*, Volume 2, and as editor of Moderator Materials, the *Reactor Handbook*, Volume 1.

These workday assignments would keep most men fully engaged. However, Gene fits into his schedule active participation in the affairs of the American Society of Mechanical Engineering, and also maintains his affiliations in the American Nuclear Society, Pi Tau Sigma, Sigma Pi Sigma, and Sigma Xi.

And with all of that, there has still been time for him to be a family man! His twin sons are pursuing degrees in the physical sciences: Dave is about to get a Ph.D. in physics from the University of Illinois, and Don is working on his Ph.D. at Cal Tech. Gene's daughters — Vicki and Anne — are students at Cornell University and the University of Michigan, respectively. Gene claims a variety of hobbies — but I do not see how he has time for such.

Walton's "compleat" man? I'd say yes. Having an Editor with the background, experience, and talent of Gene makes my assignment on the *Reviews* pretty simple! For the reader/user of the *Reviews*, it assures a publication of worth and merit./CRT

# Engineering and the Technological Society

*Last June, 40 invited engineering and social science faculty members from campuses across the country gathered at Ohio University and discussed the relationship of technology to society and what kinds of courses and curricula dealing with this subject are available or should be developed. The Conference Director was Dr. Charles M. Overby, Acting Chairman of OU's Industrial and Systems Engineering Department.*

*Since the discussions were not documented, SPR accomplished a "scoop" when Dr. Overby kindly agreed to describe the background and highlights of the Conference expressly for this issue. His writeup follows.*

## CONFERENCE ON COLLEGE COURSES AND CURRICULA ON THE RELATIONSHIP BETWEEN TECHNOLOGY AND SOCIETY

by C. M. Overby

There is much discussion, concern, criticism and some action in our society today focusing on the problems of our technological society which range from armaments and war to social and physical environmental difficulties. There is concern with our great difficulty in comprehending and coping effectively with these contemporary maladies from the top office in the land through the United States Congress down to rank and file grass roots ecological activist individuals and groups.

It is the aim of this paper to discuss a rather recent and little publicized development in this milieu on college campuses around the country — namely the growth of a variety of courses dealing with some of the issues of existence in a technological society — issues of science, engineering, technology, society and public policy.



## Technology's Critics

Students on campuses all over the country and in high schools read the dystopian novels of Huxley, Orwell and Vonnegut. They absorb the ecological contributions of Rachel Carson and hosts of other environmentalists. The writings and activities of Ralph Nader and other critics are well known. They read about the "Technocratic Society" in books such as Theodore Roszak's *The Making of a Counter Culture: Reflections on the Technocratic Society and Its Youthful Opposition*.

Important as this criticism is in a society such as ours in helping to bring about needed institutional change, it sometimes comes out sounding as if science, engineering, technology and the scientists, engineers and technologists are the ogres behind the present evils of society.\* This antitechnology attitude reminds one of the Luddite movement in early nineteenth century England when bands of working men, threatened by changing technology in the production of textiles, rampaged around the countryside literally smashing the new machines and processes. A good friend, a humanities professor, recently suggested that he would like to pull the plug on the computer and shut it off.

## Toward Social Orientation

Difficult and complex as our problems are, their solutions, if there are to be solutions, must lie through the use of individual and group human intelligence-rational analysis and synthesis. This means more science and engineering as indicated in Dr. Fawcett's recent paper.\*\* Solutions to our problems do not lie in "dropping out" or "turning off". Perhaps, however, the phenomenon of "dropping out" is one societal signal or feedback indicating a substantial need for science, engineering, and technology to be readdressed more adequately to the needs of society.

Solutions to our problems will require major inputs from the social and behavioral sciences such that social innovations and inventions take place. An historical example of one such social invention of an earlier time might be cited — namely that of John R. Commons and the Institutional Economists at the University of Wisconsin. These people got their feet dirty in the real world looking at the human social problems of a rapidly industrializing society at the turn of the century. With their orientation and through accommodation with the progressive political philosophy in the state at that time, the social invention of "Workmen's Compensation" came into existence in 1911. In economic

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*\*One has but to be aware of the work of the "muckrakers" of a prior era and their contribution to the quality of life in their time to know that publicists do make an important contribution to change — for example Upton Sinclair and his book *The Jungle*.*

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**\*\*Fawcett, S. L., "Halt Technological Advance?", *SPR*, 4(2): p. 3, 1971.**

and systems terminology they succeeded in internalizing the external diseconomies (the social costs of accidents and injury in industry) in a rapidly developing industrial society. They even designed the system so it could have feedback which would tend to stimulate safe work environments. Perhaps new forms of social invention are needed in addition to hard scientific and engineering inputs to cope with our modern physical and social environmental problems.

In adjusting to this changing flux of ideas, concerns, frustrations, and action — various developments are taking place in our system. The United States Congress is interested in "technology assessment". A number of prestigious universities around the country have developed institutional arrangements for study and research in areas of science, engineering, technology and public policy. The National Science Foundation last year established a division for research applied to national needs (RANN). Recognizing also a need for increased communication between engineers and scientists and the public, NSF recently requested proposals for approaches to enhance public understanding of science, engineering and technology. The first paragraph of this request for proposals states,

"Central to the purpose of the Public Understanding of Science Program is the enhancement of citizen knowledge and understanding of both the potentials and limitations in the case of science and technology in meeting current and emerging society problems."\*

### Scope

In a substantial measure, what follows is a discussion of one presently ongoing activity which seeks ultimately to explore with students both the potentials and the limitations in the use of engineering, science and technology in meeting current and emerging societal problems.

The remainder of this paper will discuss the development of courses in colleges and universities across the country dealing with issues of engineering, science, technology and society. What follows is by no means exhaustive. It does not purport to be a survey of all such courses but is rather an expression of the author's personal experience and involvement in teaching such a course and in conducting an NSF supported conference in June of 1971 entitled "Engineering and The Technological Society". This conference was conceived to bring together 40 engineering and social science faculty from campuses across the country for discussion and the creation of courses on engineering, science, technology and society issues.

First a brief history of the conference, some highlights of the 1971 gathering and finally a bibliography of 75 courses with names and addresses of faculty and their course titles.

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\*NSF "Guidelines for the Preparation of Proposals for the Public Understanding of Science Program." NSF 70-42.



## History

In the late 1960's Dr. Richard C. Dorf\*, then Chairman of the Department of Electrical Engineering at Santa Clara University in California, originated and taught a course entitled "Engineering and The Technological Society". By 1969 he had received funds from NSF to conduct a conference with 35 engineering and social science faculty on the Santa Clara campus whose focus would be the discussion and development of courses on engineering, science and society. The conference was repeated on the Ohio University Campus in Athens in 1970 with 35 new faculty from different campuses. It was again given this past June in Athens with 40 participants. A proposal has been submitted to carry it out one more year in June of 1972. The author was a participant in the 1969 conference, assistant director in 1970 and director in 1971.

In the three years that it has run a total of some 110 faculty from as many colleges and universities has participated. About two-thirds have been engineering faculty and one-third social scientists including the disciplines of economics, psychology, political science, sociology, history, philosophy, and law.

## 1971 Goals and Staff

A discussion of the organization and some highlights of the 1971 meeting can best be started by quoting from the statement of purpose in the conference brochure.

"The purpose of this conference is to provide an opportunity for college teachers of engineering and social science to study and discuss the relationship of technology to society and to consider the development of new courses and curricula concerned with this subject. The conference will provide the attendee an opportunity to examine engineering and its product, technology, and its integration with society's needs and problems.

The conference is founded on the assumption that we live in a technological world and that a truly educated man must be informed of the technological foundation of his society in order to influence the direction society should pursue. Therefore, it is incumbent upon engineering educators to provide a means whereby all students in a college or university can elect a course (or courses) concerned with technology and society. Engineering is the only profession which at present does little to communicate its principles, history, and future to non-major students. Within the past few years, this situation has been remedied somewhat and it is one purpose of this short course to assist in enabling instructors of engineering to

*\*Presently Vice-President for Educational Services at Ohio University in Athens, Ohio.*

develop courses suitable to their university. An equally important objective is to assist faculty in the social sciences in the development of courses concerned with the role of technology in history, government, or social processes.

Substantial emphasis will be given to presentations and discussion of courses presently being given at Ohio University, The University of Utah, Lafayette College, Case Western Reserve and the colleges and universities of conference participants. The Man Made World course of the Engineering Concepts Curriculum Project (ECCP) will be discussed. One half-day session will be devoted to a workshop on course development."

Engineers and social scientists have purposely been brought together in these meetings because the problems of our society are multifaceted, manifesting technical, behavioral, sociological, economic, legal and political ramifications. Physical arrangements were such as to enhance informal in-and-out-of-conference personal exchanges between engineers and social scientists. The program was designed to provide a mix of presentation and discussion of specific courses already being offered and provocative presentations with a non-course orientation. Course outlines were distributed to all participants for all courses discussed. Several of the participants were already actively involved with courses of their own — outlines of these were also passed out where available.

Staff for the 1971 gathering is listed below: An asterisk after the name indicates a course presentation for a currently taught course listed in the course bibliography:

Charles M. Overby, Conference  
Director\*  
Industrial and Systems  
Engineering  
Ohio University

Paul Anton\*  
College of Business  
Administration  
Ohio University

William Baasel\*  
Chemical Engineering  
Ohio University

Richard Bald  
Government  
Ohio University

Beaumont Davison  
Dean, College of Eng. &  
Technology  
Ohio University  
(Presently Vice-President for  
Regional Higher Education)

Noel de Nevers\*  
Associate Dean, College of  
Engineering  
University of Utah

Menno DiLiberto\*  
Engineering Graphics  
Ohio University

Richard Dorf  
Vice President  
Ohio University

Newman Hall  
National Academy of Engineering  
Executive Director Commission  
on Education  
Washington, D. C.

William Harlan  
Sociology  
Ohio University

H. B. Kendall\*  
Chemical Engineering  
Ohio University

Melvin Kranzberg  
Head, History of Science and  
Technology  
Case-Western Reserve University

Edward V. Krick\*  
Industrial Engineering  
Lafayette College

Dennis Livingston\*  
Interdisciplinary Studies in  
Social Science  
Case-Western Reserve University

Edward Mitchell\*  
English  
Ohio University

Reuben Olson\*  
Civil Engineering  
Ohio University

Edward Quattrochi\*  
English  
Ohio University

Edgar Whan  
English  
Ohio University

#### Conference Highlights

After introductions, Dean Davison provoked the group with an intentionally strong defense of engineering and technology. Melvin Kranzberg, in especially lively afternoon and evening sessions, presented papers on "The Human Use of Technology: Historical Perspectives" and "Technology Assessment". Among his many points there appeared his suggestion that engineers are the most profound revolutionaries of modern times by virtue of their translation of the fruits of science into technological reality.

The following morning we heard another point of view when Ed Mitchell and Edgar Whan elaborated upon the counter culture view of the technological society. Needless to say, this view is one of frustration and disillusionment with all that the term "technocratic society" conveys. Perhaps it is but another form of societal feedback relative to the goals and priorities of our institutions and will need to receive consideration. Dick Dorf next outlined his personal philosophy relative to the conference and the course he originated and taught at Santa Clara. Anton, Baasel, DiLiberto, Kendall, Olson and Overby in one morning session discussed their own courses presently being given at Ohio University.

Newman Hall reviewed some of the results of a recent workshop on "Social Directions for Technology".\* In his own view the engineer

\*"Workshop on Social Directions for Technology", Engineering Education, November 1970, page 129.

of the future will have to be a breed which includes heavy concentration of the social and behavioral sciences as part of his working tools much as present engineers use tools of physics, chemistry and mathematics. Dr. Hall also sketched out the history and development of the Engineering Concepts Curriculum Project (ECCP)\* a very early attempt (1963) to develop a course for high school students to contribute to their technical literacy for existence in a technological society even though they might never become intimately involved in a highly technical life work. Even though this project was originally aimed at the high school student, actual experience with the course has found it being successfully used in a number of colleges and universities at the freshman-sophomore level. (See the course by Dean Fletcher at the University of North Dakota.) For one wishing more firsthand information on this interesting and worthwhile venture a contact with Dr. Braun at Brooklyn Polytechnical should be most fruitful. Brooklyn Poly has had major responsibility for writing the text and developing the course. McGraw-Hill recently published the latest hardbound edition.\*\*

Continuing chronologically with the 1971 conference — Noel de Nevers and Ed Krick discussed their courses at the University of Utah and Lafayette College. An extra word on these presentations is relevant because of special circumstances in each situation.

Dr. de Nevers' course, "A General Education Course on Technology for the Non-Technology Student" is one of the few which has been given outside funding to enable its development — an NSF Science Improvement Grant. He has prepared under this grant a 113-page description of the course including a very detailed listing of study materials, suggested discussion questions and his responses. Additionally he has compiled a companion volume of collected readings for the course which is soon to be published by a major publisher. The course addresses itself to topics ranging from "The Complaints of The Humanists" to "Systems, Modeling, Optimization".

Brief mention should also be made of another course development reviewed at the 1969 conference which has received outside funding. Dr. Ralph Parkman at San Jose State College received U.S. Office of Education funds to develop his course "Cybernation and Man". He has prepared a 197-page final report dated Feb. 28, 1967, on this project outlining his approach with extensive tape, film, book and periodical bibliographies.

Ed Krick for many years has been active and interested in course development in engineering for majors and non-majors.\*\*\*The statement

\*David & Truxal, "The Man Made World: A New Course for High School", Science, Vol. 156, 19 May 1967, pp. 914-920.

\*\*ECCP, The Man Made World, McGraw-Hill, 1971.

\*\*\*Krick, E. V., An Introduction to Engineering and Engineering Design, Wiley, 1965.



of the primary objectives of his course for non-majors is indicative of his view.

- I. To contribute what in this age, is a vital part of your general education. Much in life is shaped, sustained, driven and tormented by technology — be it at home, at work, enroute, or in leisure. An education is hardly complete if it is blind to the origins, nature and impact of this omnipresent force.
- II. To prepare you for a career in an age in which technology is so pervasive and influential.
- III. To better prepare you for citizenship in a world in which technology is a significant part of most major social problems and public issues.
- IV. Provide you with a balanced view of engineering and of engineers — by exposing you to a wide range of views and by improving your ability to discriminate as you hear and read diverse and sometimes extreme commentaries on engineering and its practitioners."

In addition to his own course interests Krick, as a result of developments at the 1970 Annual Conference of the American Society for Engineering Education (ASEE), assumed responsibility for establishing a clearinghouse for courses for non-engineers. He now calls it EPNE, The Center for information on Engineering Programs for Non-Engineers. In his words,

"The prime purpose of the Center is to encourage and assist academic ventures which familiarize nontechnical faculty and students with the nature and impact of engineering. It does so by facilitating the exchange of information on courses, curricula, projects, and whatever other mechanisms engineering educators can employ to bridge the gap."

Anyone interested in tapping this resource should find a contact with Professor Krick very rewarding.

Our 1971 conference changed pace again with a political scientist's view of our technological society when Dr. Bald held forth on questions of natural resources, war and armaments, societal goals, priorities, and public policy.

Dr. Livingston next reviewed his futuristic course "Alternative World Futures" in which he emphasized the importance of including science fiction, and utopian-distopian writers as inputs to courses dealing with a rapidly changing technological society. This thread was picked up again the following morning when sociologist, Dr. Harlan, left us with a sociological view of the technological society ending on a point that most human beings and human societies have a connection with the past but also tend to be future oriented. Moving from this Dr. Quattrochi reviewed his literary interests in the great utopian-distopian writers integrating very well with the view that science, engineering and technology is future oriented.

Dorf and Overby held a session on Technological Forecasting and Technology Assessment raising questions as to institutional arrangements whereby technological developments can be forecast and assessed. The group participated in a forecasting and assessment exercise used by the World Future Society at their first general assembly in Washington, D.C., in May 1971.\*

In a Friday afternoon spontaneous session one of the participants, Dr. J. Edward Anderson from the University of Minnesota, outlined and discussed the very interesting process by which he has been instrumental in developing an interdisciplinary research group at the University of Minnesota around the general issue of urban transportation with a specific focus on Personal Rapid Transit (PRT). His tale (including getting his feet into the real world of real estate interests, metropolitan planning commissions, and the Minnesota State Legislature) reminded the author of some of the work of the Wisconsin Institutional Economists mentioned earlier in this paper. His presentation was a case study in organization for interdisciplinary research around the urban transportation problem.

Our conference concluded on Saturday morning with two workshop groups on problems and possibilities for course development. One group focused on courses in which attempts are made to acquaint non-engineers with engineering concepts and approaches to problem definition and synthesis. The other concentrated more on courses dealing with the impact of technology on society.

#### Interdisciplinary Exchanges Valuable

In reflecting on the conferences and specifically the most recent one, the author enthusiastically concludes that there is considerable merit in bringing together engineering and social science faculty from diverse colleges and universities on the topic of courses relating technology and society. The cross fertilization of ideas and approaches has seemed to be effective and productive. In the author's "Engineering and The Technological Society" course at Ohio University, which includes a number of guest lecturers from non-engineering areas, this same experience of at least some communication between disciplines has been a healthy by-product of the course.

An additional reflection arising out of experience with these conferences and the course leads the author to the conclusion that there is genuine interest on the part of many engineers and social scientists to address themselves to real problems in society but that in many ways our academic-governmental institutional arrangements do not help to encourage active interdisciplinary research of this type. We need to look for new institutional arrangements that can enhance the possibility for additional numbers of capable and interested persons to engage in such work.

\*"Dimensions of the Future: Delphi-Societal Choice and Assessment Questionnaire"; *The Futurist*, Vol. V, No. 2, April 1971.



To this end the author is presently exploring with a governmental funding agency the possibility of an intensive one-week conference on Interdisciplinary Research having to do with modern problems of society. The intent of this meeting would not be so much to convey technical information on such research but rather to concentrate on problems of organizational, institutional arrangements and innovative possibilities to enable us to transcend some of our present rigidities and get more persons involved in these important problems. Proposed would be a series of case studies by presently active researchers with a focus on their organizational arrangements and difficulties. Dr. Anderson's case study cited earlier is a good example of what might be. Participants to the conference would be pairs of engineers and social scientists from campuses around the country who were interested in getting started in working with these multifaceted problems. In order to further develop these ideas, suggestions and comments from readers of this paper would be most welcome.

### Technology-Society Courses

In conclusion — the bibliography of courses which follows was obtained by hurriedly going through materials on past conferences with the 1971 event having the greatest input because of its recency. No attempt was made to survey past participants so undoubtedly a number of good courses arising out of conference participation are not included. Based on the substantially healthy and favorable experience with these people, either as staff or participants, they would be happy to respond to inquiries about their individual courses.

Faculty Member	Course Title
Dr. Raymond J. Adamek Sociology Kent State University Kent, Ohio 44242	"The Sociology of Work" "Computer Applications in Social Science"
Dr. Gerry B. Andeen Mechanical Engineering Michigan Technological Univ. Houghton, Michigan 49931	"Technology in the Context of Society"
Dr. & Mrs. James Anderson Materials Science University of Rochester Rochester, New York 14627	"Science, Technology & Human Values"
Dr. J. Edward Anderson Mechanical Engineering University of Minnesota Minneapolis, Minnesota 55453	"Ecology, Technology & Society"
Professor Paul Anton College of Business Administration Ohio University Athens, Ohio 45701	"Technological Forecasting"
Dr. John L. Artley Electrical Engineering Duke University Durham, N. C. 27706	"Interdisciplinary Social Science Resources for Engineers"

Faculty Member	Course Title
Dr. William Baasel Chemical Engineering Dept. College of Engineering & Technology Ohio University Athens, Ohio 45701	"Interdisciplinary Freshman Course"
Professor Michael S. Baram Executive Officer, Law Massachusetts Institute of Technology Cambridge, Massachusetts 02139	"Legal Aspects of New Technology"
Dr. John T. Berry Manufacturing Engineering University of Vermont Burlington, Vermont 05401	New course concerned with society and technology being proposed
Dr. David Botting College of Engineering University of Washington Seattle, Washington 98105	"Technology in Contemporary Western Culture"
Dr. Paul W. Braisted Mechanical Engineering University of Missouri Columbia, Mo. 65201	"Man and Technology"
Dr. Ludwig Braun Brooklyn Polytechnical Institute Brooklyn, N. Y. 11200	Active involvement with the Man-Made-World project at Brooklyn Polytechnical

Faculty Member	Course Title	Faculty Member	Course Title
Dr. Julius Brown College of Engineering Southern Illinois University Edwardsville, Illinois 62025	"History of Technology" "Technology and Its Impact on Society"	Professor Albert H. Jacobs Industrial Engineering Western New England College Springfield, Mass. 01119	"Technology in Society"
Dr. Herbert W. Busching Civil Engineering Clemson University Clemson, S. C. 29631	"Contemporary Socio- Environmental Problems"	Dr. Cedric H. Jaggard Professor, General Studies Milwaukee School of Eng. Milwaukee, Wisc. 53201	Course being developed in the relationship between technology and society
Dr. Donald I. Buzinkai Political Science Kings College Wilkes-Barre, Pa. 18702	Honors Seminar on "Modern Society"	Dr. Henry A. Kallsen College of Engineering University of Alabama University, Alabama 35486	"Engineering Philosophy"
Dr. Monte Calvert Department of History Iowa State University Ames, Iowa 50010	"History of Technology"	Dr. Glenn H. Keitel College of Engineering Drexel Institute of Technology Philadelphia, Pa. 19100	"Electrical Engineering and Society"
Dr. Nickander J. Damaskos School of Engineering PMC Colleges Chester, Pa. 19013	"You and Technology: A High School Course for All Students"	Dr. H. B. Kendall Chemical Engineering Ohio University Athens, Ohio 45701	"History of Technology"
Dr. Thomas Dean College of Engineering Oklahoma State University Stillwater, Oklahoma 74074	"Societal Aspects of Technology"	Dr. William R. Kincheloe, Jr. Electrical Engineering, Senior Research Eng. Stanford Electronics Laboratories Stanford, California 94305	"Technology and Social Change"
Dr. Noel deNevers College of Engineering University of Utah Salt Lake City, Utah 84100	"A General Education Course on Technology for the Non-Technology Student"	Dr. Teresa Carr King, Director Graduate Division of Public Administration Roosevelt University Chicago, Illinois 60605	"Alternative Futures and Their Implications for Public Policy Today"
Dr. Menno DiLiberto College of Engineering & Technology Ohio University Athens, Ohio 45701	"Engineering and Technology: A Freshman Engineering Course for All Students"	Dr. George L. Kramerich Electrical Engineering Cleveland State University Cleveland, Ohio 44115	"The Social Aspects of Advanced Engineering Technology"
Professor Eldredge Department of Sociology Dartmouth College Hanover, N. H. 03755	"Futurism and Long-Range Planning"	Dr. Jerrold Krenz, Director Engineering Honors Program University of Colorado Boulder, Colorado 80302	"Science and the Modern World"
Dr. Alan G. Fletcher Dean, College of Engineering University of North Dakota Grand Forks, N. D. 58201	"Understanding Engineering and Technology — An Introduction" — based on the Man-Made-World text	Professor E. V. Krick College of Engineering Lafayette College Easton, Pa. 18042	"Foundations of Modern Engineering" An Introductory Course for Majors and Non Majors"
Dr. Robert William Fox Mechanical Engineering Purdue University Lafayette, Indiana 47907	"Introduction to Engineering"	Dr. Jean LeMee Mechanical Engineering Cooper Union School of Engineering New York, N. Y. 10003	"Developing Course on the Interaction of Engineering and Society"
Dr. Michael J. Furey College of Engineering Virginia Polytechnic Institute Blacksburg, Virginia 24061	"Socio-Technical Problems"	Dr. Dennis Livingston Interdisciplinary Studies in Social Science Case-Western Reserve University Cleveland, Ohio 44106	"Alternative World Futures"
Professor Edward B. Garrison Assistant Dean College of Engineering The University of Toledo Toledo, Ohio 43606	"Technology and Society"	Dr. Donald A. Mankin Psychology, Department of Lehigh University Bethlehem, Pa. 18015	"Psychological Basis of Habitable Environments"
Dr. Johannes Gessler Civil Engineering Colorado State University Fort Collins, Colorado 80521	"Introduction to Engineering for Non-Engineers"	Professor John D. McCrumm Electrical Engineering Swarthmore College Swarthmore, Pa. 19081	"Principles and Problems of Modern Technology: An Engineering Course for Non- Science Majors"
Professor George T. Hankins Electrical Engineering Wright State University Dayton, Ohio 45431	"Technology and Society"	Dr. Clyde D. McKee, Jr. Chairman, Urban & Environmental Studies Advisory Committee Trinity College Hartford, Connecticut 06100	Developing new courses within an urban and environ- mental program
Professor George Hermon Assistant Dean College of Engineering Montana State University Bozeman, Montana 59715	Developing new course on engineering and technology for non majors	Dr. Hugh McQueen Materials Science Sir George Williams University Montréal, Quebec, Canada	"Impact of Technology on Society"
Professor Dwight S. Hoffman Associate Dean College of Engineering University of Idaho Moscow, Idaho 83843	Developing new course on engineering technology for non-engineering students		

Faculty Member	Course Title	Faculty Member	Course Title
Dr. Ernest W. Mellow Chemical Engineering West Virginia Institute of Technology Montgomery, W. Va. 25136	Developing course in technology and the prob- lems of society	Dr. Lester J. Schmid Agricultural Business Program Chairman Southwest Minnesota State College Marshall, Minnesota 56258	"Technological Change in Agriculture"
Dr. Edward Mitchell English Department Ohio University Athens, Ohio 45701	"Technocracy"	Dr. Joseph P. Schwitter Department of Management Kent State University Kent, Ohio 44242	"Honors Colloquium on Technology and Theories of Social Change"
Dr. David E. Moe Windham College Putney, Vermont 05346	"Science and Society"	Dr. Milton D. Shanklin College of Agriculture Dept. of Agricultural Eng. University of Missouri Columbia, Mo. 65201	"Ecological and Social Aspects of Engineering with Emphasis on Food Production"
Dr. Michael O'Brian Dept. of Agricultural Engineering University of California Berkeley, California 95616	"Social Implications of Mechanization in Agriculture"	Dr. Henry P. Sheng College of Engineering Youngstown State University 411 Mathews Road Youngstown, Ohio 44512	"Technology and Society"
Dr. Reuben Olson Civil Engineering Department College of Engineering Ohio University Athens, Ohio 45701	"Fluid Mechanics for Non-Engineers"	Dr. William T. Snyder Department of Engineering Mechanics The University of Tennessee Knoxville, Tenn. 37916	Developing course dealing with technology and social issues
Dr. Charles Overby Industrial and Systems Engineering Department Ohio University Athens, Ohio 45701	"Engineering and The Technological Society"	Dr. Thomas Stauffer Political Science Dept. Keene State College Division of University of New Hampshire Keene, New Hampshire 03431	"Human Survival"
Professor Sarah H. Pappas Sociology Department St. Petersburg Jr. College Clearwater, Fla. 33515	Developing course on tech- nology and society at the community college	Professor Robert B. Thornhill College of Engineering Wayne State University Detroit, Michigan 48202	"Engineering and Society"
Dr. David M. Park Dept. of Mechanical Eng. Pennsylvania State University University Park, Pa. 16802	"Technology - Its Char- acter, Role and Function"	Dr. George Town College of Engineering Iowa State University Ames, Iowa 50010	"Engineering and Society" "Engineering for Non Engineers"
Dr. Ralph Parkman School of Engineering San Jose State College San Jose, California 95114	"Cybernation and Man"	Dr. Wilson Tripp Mechanical Engineering Kansas State University Manhattan, Kansas 66502	"Impact of Engineering Technology on Society"
Dr. Anthony J. Pennington Electrical Engineering & Urban Technology Drexel Institute of Technology Philadelphia, Pa. 19100	"Technology and Society"	Professor Leonard Weber Dept. of Electrical & Electronics Eng. Oregon State University Corvallis, Oregon 97331	"Honors Colloquium on Technology Assessment and Technology and The Quality of Life"
Dr. Albert I. Prince Department of Psychology Marietta College Marietta, Ohio 45750	"Contingency Management: A Behavioral Approach to Environmental Quality"	Dr. J. R. Whinnery College of Engineering University of California Berkeley, California 94700	"The History and Impact of Technology in America"
Dr. Edward Quattrocki English Department Ohio University Athens, Ohio 45701	"Utopias"	Dr. C. P. Wolf Sociology Department Brown University Providence, Rhode Island 02912	"Technology and The Moral Order"
Dr. Walter Rand School of Engineering and Architecture Department of Civil Eng. The City College of The City University of New York New York, N. Y. 10031	"Science, Technology and Human Culture" "History of Science and Technology"	Dr. Jack R. Woolf Office of Institutional Studies The University of Texas at Arlington Arlington, Texas 76010	"Engineering and Tech- nology in Twentieth Century Society"
Dr. Lee Rosenthal Engineering, Professor Stevens Institute of Technology Hoboken, New Jersey 07030	"Art and Technology"	Professor Donald Worrell Dept. of Theoretical and Applied Mechanics West Virginia University Morgantown, W. Va. 26506	"Appreciation of Tech- nology: For Non Engineers"
Dr. Robert Rothman College of Arts & Science Dept. of Sociology 133 Willard Hall Education Building University of Delaware Newark, Delaware 19711	"Sociology of Science and Technology"	Dr. Leon Zelby, Director College of Engineering School of Electrical Engineering The University of Oklahoma 202 West Boyd, Room 219 Norman, Oklahoma 73069	Courses proposed in: "The Impact of Electricity" "Technology and Society"

# U. S. Energy Predicament

*"Population explosion", "unprecedented energy consumption", "brownouts", "looming fuel shortages", "thermal pollution", "smoke-stack effluents", "radioactive contaminants" — these terms are becoming increasingly familiar to the U.S. public. Suddenly a crescendo of voices is crying out about energy problems that may become unsolvable if allowed to progress much farther.*

*This proliferation of concern is reflected in a proliferation of energy-crisis literature. In all of 1970 Science Policy Bulletin (SPR's predecessor) published about a dozen abstracts covering the U.S. energy situation, while in 1971 the first two SPR issues alone carried 65 abstracts on the subject.*

*If anything, the pace is accelerating. Dozens of "energy" editorials and Congressional Record entries have appeared in the past few months. Scientific American devoted its entire September issue to 11 articles on various aspects of the subject, The Bulletin of the Atomic Scientists doubled the ante — 24 "energy crisis" articles in two special issues (September and October).*

*Also, on July 6, 7, and 8, the New York Times published a 3-part feature on the energy crisis that might well have been written expressly for SPR, since it emphasizes those aspects relevant to decision making. For the benefit of our readers who missed it, we present a condensation here.*

## NATION'S ENERGY CRISIS\*

by John Noble Wilford

### It Won't Go Away Soon

... Americans are demanding more and more energy — more petroleum to turn the wheels of transportation, more oil, natural gas and coal to fire the boilers of electric utilities, more fuels and electricity for heat in the winter, air-conditioning in the summer and the year-round operations of industry. In the last 15 years, total consumption doubled; in the next 15 years, it is expected to double again.

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But Americans are also demanding a quality environment. Appalled at ugly strip mines, oil slicks from tanker spills and leaky offshore wells, denuded corridors of land for transmission lines, sulphur oxides and fly ash from power plants and the specter, real or imagined, of radioactive perils from nuclear centers, they are resisting the construction of precisely those new facilities that are essential to the production of more power.

In the last few years, moreover, numerous technical breakdowns at power plants and miscalculations by both utilities managers and Federal officials have, under the most charitable interpretation, made an inevitable crisis worse.

Now, when thoughtful people close to the issue talk about solutions, they almost unanimously fall back on nuclear energy as the only satisfactory way to accommodate society's needs and keep the traditional energy distribution system intact.

But some are also beginning to ask questions about the larger economic system itself, about its underlying notion of free-wheeling, permanent growth and about what, short of rigid national controls, could replace it if it should fail to meet the crisis.

Is it possible to have a thriving, motorized, computerized, air-conditioned society with a high standard of living shared by as many as possible and a largely uncontrolled economy — and to have a healthy, comfortable, even beautiful, environment, too?

### **A Faustian Bargain**

At the beginning of the Industrial Revolution man unconsciously but decisively struck a Faustian bargain, giving up a bucolic environment for a power beyond anything his and his animals' muscles could provide . . .

Only now — now that the world is more crowded and energy is being expended at a rate more prodigious than anyone could have foreseen when Watt invented the steam engine — are the implications becoming sharply defined in the form of a perplexing question:

Can modern man strike a balance where he once struck a bargain?

The difficult search for answers, only barely begun, leads down many avenues: economic, technological, ecological, political, social and philosophical . . .

In order to obtain a balance with the environment, do you slow down the accelerating trend of energy consumption — and if so, how?

### **Stagnation a Risk**

Americans are 6 percent of the world's population, but consume 35 percent of the world's energy output. Since 1947, their consumption of electricity has been rising at an average rate of 7 percent a year. Natural gas consumption has been rising at a rate of 5 to 6

percent a year, with oil at 3 percent and coal at 2 percent.

Last year, despite the economic recession and declining birth rates, consumption rose even more sharply. Americans used 4.5 percent more energy than in 1969, and 9.2 percent more electricity.

If this consumption trend continues, Americans in the year 2000 would be using the equivalent of 76 trillion kilowatt hours of electricity and other energy sources — nearly four times the present usage rate.

But will the trend continue? Can it? Should it? And if it does not, do you risk economic stagnation, unemployment, even a decline in national power *vis-a-vis* the rest of the world? Can you accept the psychological wrench of living in a nation with its foot off the accelerator, after two centuries of vigorous and glorified growth?

Or do you increase the energy output, since it is a human tendency to want more and since it will take massive amounts to recycle wastes, treat sewage, run air-pollution-control mechanisms and power mass transportation systems needed to reduce auto pollution?

Do you raise prices of fuels and electricity to help pay for cleaning up the environment — even if it means dimming the prospects of poorer people to share fully in the high-energy society?

Do you encourage development of new, "cleaner" energy technologies — and if so, which ones? Can you get people who are increasingly disillusioned with technology to accept more nuclear power and pay for greater research toward "nonpolluting", virtually inexhaustible power from controlled nuclear fusion?

Or do you reject nuclear energy and continue to "live off earth's capital" — the limited, non-renewable fossil fuels (coal, oil and gas) that took millions of years to form and, in some cases, may last only another century? What, then, do you leave for generations to come?

And even if energy resources were infinite — if fusion became a practical way of supplying nuclear power years from now — do you want power plants everywhere you look? Do you ignore the warnings of scientists who say that the environment is finite? . . .

### **Slight Move Toward Accord**

There are, however, some small beginnings toward a reconciliation . . . This is occurring where the problem is especially acute and controversial — over the issue of where to build new power plants . . .

Proposed plant sites are being scrutinized more closely than ever. Even without serious opposition from conservationists, it now takes six to eight years for a new plant to move from conception to operation. Consolidated Edison Company's proposed Storm King plant on the Hudson has been tied up in the courts since 1965 — with no resolution in sight.

An experiment in Minnesota serves as a possible model for reducing some delays raised by environmental questions.

Early last year, the Northern States Power Company in Minneapolis decided to share some of its decision-making responsibility



for plant site selection with groups concerned with protecting the environment. Under a policy of "open planning", representatives from some 30 groups joined a task force set up by the utility.

Some were skeptical, suspecting it was only a public relations ploy. Some in the company were none too happy about sitting down with their sharpest critics. But after six weeks of meetings, recalls R. W. Comstock, Northern States Power's director of environmental affairs, the more vociferous critics settled down and the task force got busy on its recommendation for where to put the company's next power plant.

### **Recommendation Followed**

They had four sites from which to choose. They rejected the company's first choice, the Louisville swamp on the Minnesota River, because the area was being considered as a state park. They ruled out two other possibilities because other plants were already in the area. Instead, they selected a site in Moticello, Minn., which the company deemed the least desirable economically. Nevertheless, Northern States Power followed the recommendation.

"It looks at this point as if the company will be able to install a generating station without a major public confrontation for the first time in over a decade", Mr. Comstock says. The citizens group has moved on to studies of future plant sites and the whole question of future energy needs.

Open planning is still highly controversial. Some utility executives see it as just one more nuisance in the already difficult procedure of getting plant sites approved. In some states, utilities must get 30 to 40 licenses, permits and certificates — from power, health, wildlife, waterways and other agencies — during the course of planning and building a plant.

Conservationists would like to see more utilities adopt more planning similar to the Minnesota example, but preferably at an even earlier stage of decision-making. Eventually, they want it made a permanent, legislated part of utilities industry operations . . .

The Edison Electric Institute, an association representing 185 of the major investor-owned utilities, favors an approach to plant-site approval called "one-stop shopping".

### **'One-Stop Shopping'**

The idea, which a few states have adopted, is to expedite site approvals by eliminating the need for a utility to go through two or three dozen state agencies. One agency, usually the equivalent of the public utility commission, would have overall authority. Such is the purpose of legislation supported by Governor Rockefeller in the New York State legislature this year.

Most conservationists find one-stop shopping unacceptable. State utility commissions, they complain, are "historically in the pocket of

industry" and do not normally take into serious consideration such issues as land conservation, wildlife protection and water pollution problems.

While plant-siting delays could prolong the crisis, that was only one factor in bringing about the immediate energy problems. Aside from pressures generated by environmentalists, the crisis is seen as the almost inevitable result of management miscalculations, technological troubles and certain Government policies.

In the case of electric power, for example, the nation's utilities underestimated demand. The Federal Power Commission had predicted in 1964 a 6.5 percent annual growth rate, which became the basis for most planning. But the growth rate in recent years has run close to 9 percent because, in part, of an unexpectedly sharp rise in air-conditioning.

Another miscalculation was made back in 1966 when the nation's first truly commercial nuclear plant was completed at Oyster Creek, N.J. Utilities began "thinking nuclear". They rushed to place orders. Consequently, the coal industry slowed down the development of new mines and, looking for new markets, signed some big export contracts, especially with Japan.

But manufacturers had trouble meeting delivery schedules for nuclear facilities. Some of the units had to be sent back to the factory because of poor workmanship. Shortages of skilled construction labor, strikes and various installation problems also contributed to delays of months and often years.

By then, one energy expert says, "it was too late to shift gears". Utilities were forced to rely a little longer on their older generators, which presented maintenance problems of two kinds.

One was the result of the utilities' "load-building" promotional policies, industry experts explain. They heavily promoted air-conditioning, among other things, so that summer and winter demands would balance out. But their success left them with little time to take generators "off line" for maintenance. The result was more equipment breakdowns...

Short-sighted management is often given as another reason for the utilities' current predicament. The utilities, their critics say, have rarely attracted the more talented engineers or encouraged technical or managerial innovation...

### **Federal Agencies Blamed**

Some of the blame, the utilities contend, rests on the Government regulatory bodies for the way they establish electricity rates. Utilities complain that they are not usually allowed to charge enough to finance expansion as rapidly as necessary...

The low rates, which are based primarily on a return on invested capital, are also cited by the industry to explain its reluctance to invest heavily in research. Many of the state power commissions do not allow the companies to treat research as a business expense.

Utilities now spend less than 1 percent of sales a year directly on research, primarily on transmission technology. Most fundamental research is financed by the Government and the electrical equipment manufacturers.

Another critical element in the current crisis involves the supply of fuels . . .

### **No Imminent Threat**

Although fossil fuel resources are finite, there is no threat of imminent depletion. According to recent Government estimates, the earth's coal will probably hold out for at least three or four centuries. Natural gas and oil, including that in oil shale and in the polar regions, may run out in a century.

But there is the more immediate problem of getting the fuels, especially the cleaner, environmentally acceptable ones, out of the ground and to market in sufficient quantities . . .

On a national scale, there is a developing consensus among engineers and economists, utility executives and environmentalists over the need for a better-coordinated, long-range energy policy.

The "unrealistically" low price of electricity commands much attention. A 1 percent tax or a surcharge on all electricity bills has been recommended to finance research in new technologies and to help curb demand. A similar suggestion, which President Nixon has endorsed, is that energy prices should reflect the "full cost to society" — what the product costs in water and air pollution as well as in raw materials and other conventional costs . . .

### **Nuclear Future Looms**

... Slowly, reluctantly and fearfully, the United States is moving toward a nuclear-powered future. It is not that people have learned to love the atom; it is because few can think of any other acceptable answer to the nation's energy crisis.

Nuclear power is technically difficult, initially expensive, a source of thermal pollution and the subject of acrimonious controversy and widespread anxiety about possible radiation hazards.

And yet to a growing number of technologists, economists and political leaders, it is the only way within the traditional economic system to meet the ever rising consumer demand for a steady supply of reasonably inexpensive power without ravaging the environment.

Thus the Nixon Administration has made nuclear power the keystone of its "clean energy" plan for the decade. And future Administrations, barring unforeseen discoveries, can be expected to follow the same general policy.

For nuclear power, despite its drawbacks, is without doubt more plentiful, ultimately cheaper and relatively less damaging to the environment than other fuels. The alternatives, in other words, could be worse.

Coal, for example, is still plentiful; it might last for a few more centuries. But it cannot last forever. Most coal moreover, is too full of sulphur to meet present environmental standards . . .

### **An Alchemist's Dream**

Nuclear reactors now produce 1.4 percent of the nation's electricity. By 1980 the figure is expected to be 25 percent, and by the turn of the century 50 percent. Electricity then will crackle along high-voltage lines from "nuclear parks", clusters of reactors far from urban centers, and through submerged lines from reactor stations on platforms anchored miles out in the Atlantic and Pacific waters.

Present nuclear reactors will seem old-fashioned. The more advanced types, called "breeders", will be a sort of alchemist's dream, making more fuel than they consume. Eventually, perhaps as early as the year 2000, there may be machines, based on the sun's energy-generating processes, that run on fuels almost as abundant as water itself.

But no energy-environment equation is ideal, not even the nuclear alternative. Nuclear power has its drawbacks, too.

Its technology has turned out to be more complex than expected. Development costs are high. Capital costs of a large nuclear plant have risen sharply in the last three years, from about \$120 for each kilowatt capacity to more than \$200.

Nuclear reactors produce even more waste heat than fossil-fuel generators. The problem of "thermal pollution", the heating of a stream or lake to the point that it can become inhospitable to fish, has disturbed environmentalists. And the safety of reactors is a matter of bitter controversy . . .

### **Tougher Safety Rules**

Responding to recent attacks, the Atomic Energy Commission announced last month [June] even stricter safety standards for nuclear reactors and reduced sharply the limit on the amount of radiation exposure that the public is permitted to receive from reactors — down to 1 percent of the level permitted under current Federal radiation standards. Still, some critics raise questions about long-term genetic effects from repeated exposure to these miniscule doses.

These drawbacks and fears have been largely responsible for the slow and reluctant acceptance of nuclear power — until now. Whatever their reservations, engineers and many environmentalists, economists and utility executives now can see no realistic alternative to the atom . . .

The trend toward nuclear power is strong. Although only 21 commercial nuclear reactors are now in operation, supplying less than 1 percent of the nation's energy needs, more power-generating capacity is now on order for atomic plants than for the conventional



types. There are 54 under construction in this country, and orders for 42 more. Even a major Texas utility, in the heart of gas country, plans to go nuclear.

### **\$2-Billion Asked by Nixon**

The nuclear commitment was reinforced last month [June] when President Nixon asked Congress to pledge \$2 billion in Federal funds over the next decade for development of a commercial "fast breeder" reactor. This is considered the next major step in nuclear technology . . .

To many scientists, however, the breeder is only an interim technology, a holding action until they can master the difficult art of controlling thermonuclear fusion. This is the release of tremendous energy through the fusing of light atoms, which is the basis of the hydrogen bomb and of the nuclear reactions going on inside the sun . . .

Fusion's promise seems to make the continued effort worthwhile. Fusion produces few worrisome radioactive wastes except tritium, which most specialists believe can be recycled through the system without significant hazard.

More advanced fusion techniques might lead to direct conversion from energy to electricity, thus bypassing the steam process and its waste-heat inefficiencies. A runaway chain reaction would be unlikely, since the fusion reaction stops if it cools ever so slightly . . .

Not all current energy research involves nuclear technology.

A number of researchers are working on processes to remove polluting chemicals from fuels before combustion and on devices, such as improved electrostatic precipitators, to clean stack gases . . .

One of the more promising lines of research is directed toward converting high-sulphur coal into sulphur-free, pipeline-quality gas — a synthetic form of natural gas.

The Department of Interior's Office of Coal Research is doubling its efforts in coal gasification, aiming toward the operation of a large demonstration plant by 1976. A smaller pilot plant is running in Chicago.

### **Heating Crushed Coal**

The gasification process involves heating crushed coal under very high pressures. Reactions between steam and the coal's carbon give off carbon monoxide and hydrogen. In a series of further reactions, sulphur is removed and the gases are converted to methane, which is what natural gas is . . .

Through evolving combinations of research, nuclear and otherwise, the nation's engineers, scientists and energy managers hope to find the technological "fix" for the current crises. It is a traditionally American response, this faith that it all can be worked out through some more Yankee ingenuity.

There are those, however, who have some doubts. Even new technologies, they say, may not be sufficient unless Americans learn to curb their seemingly insatiable appetite for more and more energy . . .

### **Is Unbridled Growth Indispensable to the Good Life?**

In searching for ways to meet the nation's soaring energy needs without damaging the environment, some American experts are beginning to question one of this country's most cherished beliefs: the idea that boundless economic growth is indispensable to the good life.

If the environment is finite, according to these social scientists, engineers, economists and environmentalists, then perhaps economic growth has its limits too, particularly the unbridled growth that has characterized the United States almost from the start.

What those limits are, or more specifically how a slow-growth economy would be managed and what the social and political implications of such a policy of national planning might be, are questions that the critics of growth have given little detailed thought to.

But they agree that the changes needed to contain the energy crisis may well prove to be radical since, if the logic of the situation is carried to its end, whoever sets priorities for energy consumption wields enormous power over the economy and over the entire national life style . . .

### **A Host of Problems**

Controlling growth, economists say, would confront the nation with a host of difficult problems. Unemployment could rise. The poor could be locked in their poverty. Education, research and cultural pursuits might suffer. The nation could lose economic and political stature.

Millions of individual decisions traditionally made through the random choices of consumers and the supply-and-demand forces of a relatively uncontrolled economy would have to be passed upward to the national level and made through some form of comprehensive national planning.

Most authorities agree that such far-reaching Government power would run against the American grain and that the American people would not easily accept more controls unless the energy crisis got much worse. What the critics of growth are saying, in a word, is that the crisis is getting worse, and rapidly . . .

When slow-growth or no-growth ideas are raised, businessmen, economists and engineers usually react with variations of the time-honored principle that growth is progress and progress is good . . .

But a crisis, if not completely catastrophic, can change thinking patterns and give impetus to social invention, as the economic crisis



of the Depression years did in this country. To ecologists, such radical thinking is once again a necessity . . .

### **Cutback Won't Be Easy**

Slowing down the rate of increase in energy consumption will not be easy. It would not help much to abolish many of those gadgets of affluence, such as the electric toothbrush or electric carving knife . . .

The big residential consumers are refrigerators, electric air-conditioners, freezers — all considered necessities by the "haves" and desired objects by the "have-nots". New Yorkers, for example, may not want Con Edison to spoil the Hudson Valley any more with power plants — but they keep buying more air-conditioners.

And residential consumption is slightly less than a third of the total. According to the Edison Electric Institute, 41 percent of electricity is consumed by industry, 32 percent residential, 23 percent commercial (stores, shopping centers, office buildings, hospitals, etc.) and 4 percent others (street lights, subways, etc.).

How to slow down growth — through restrictions on energy consumption or reductions in economic development in order to curb energy demand — is something most economists would rather not contemplate . . .

Any fundamental curbing of energy consumption, economists say, would mean stabilizing the gross national product, the total output of goods and services, which currently runs at an annual rate of slightly more than \$1-trillion.

The only remotely realistic way to do that, the economists add, is to reduce the hours people work each week. It would mean asking people to trade added income for more leisure, to sacrifice future increases in their standard of living . . .

The effect this could have on poor people presents a serious problem. Methods often suggested for reducing energy consumption, such as substantial price increases, would hit the poor hardest . . .

For these reasons, critics often call slow-growth ideas an "elitist" attitude, which one industry executive described as "I've got mine, Jack, let's stop here." . . .

### **Conflict Over Timing**

But the conflict between many economists and ecologists may be over matters of timing and magnitude rather than of principle . . .

It is also possible that growth rates will begin to taper off because of natural economic and cultural forces . . .

Even without additional taxes or surcharges to support research and to discourage over-use, all forecasters predict considerably higher costs of energy, perhaps 50 percent increases in the next decade. This would be a result of resource scarcities and the costs of antipollution measures.

And it just may be that there is a saturation point for human energy needs. How many more cars and air conditioners and appliances can the American middle classes need or want? Perhaps the consumers' boom will cool off. Perhaps at some point most growth in energy demand will reflect population gains and the acquisitions of poorer people . . .

### Basic Social Issues

But to embark on a conscious policy of curbing growth raises fundamental social questions that go much deeper than the economics of living. They strike at the heart of American ethics and philosophy . . .

No crisis so complex can be easily solved, but the few ideas being discussed generally involve the types of social innovations that may be necessary to match the nation's technological capabilities. The ideas center on some kind of national energy policy in the broader context of national economic and environmental planning. As a beginning, air and water and other environmental standards are being established on a national basis for the first time . . .

### New Ideas Discussed

Since he joined the General Electric Company last year, Dr. Thomas O. Paine, former head of the National Aeronautics and Space Administration, has initiated a "strategic study" of the nation's energy situation. The study, which is not yet completed, explores such ideas as regional land-use and water planning, a national energy system of interconnected transmission lines and priorities for resource exploitation and technological development.

These represent the probing first steps as the nation learns to make the transition from what Dr. Boulding of the University of Colorado calls the "cowboy economics" of unfettered growth to the planned, orderly growth of "spaceship economics", the concept of man's dependence on a finite, enclosed life-support system known as earth.

The energy crisis reflects the difficulty of that transition, the slow weighing of the costs of radical social change against the costs of letting things go unchanged . . .

# Current Literature

## AGRICULTURAL SCIENCES

914. *The Population Explosion and the Green Revolution*, Hearings before a Subcommittee of the Committee on Appropriations, House of Representatives, 13 May 1971, 22 pp. (Available from U.S. House of Representatives, Committee on Appropriations, Washington, D.C. 20515.)

Consists mainly of a detailed explanation by Dr. N. E. Borlaug, Nobel Peace Prize winner, of the techniques and implications of "The Green Revolution" — the development of strains of grain having enormous yield and nutritional value, for coping with the population explosion on a short-range basis; concludes with Dr. Borlaug's answers to questions by various Congressmen.

## ALASKA PIPELINE

915. Moler, M., "Emphasis on Protection Will Make Big Alaskan Pipeline Better, Safer", *Congressional Record*, v. 117, no. 139, 23 September 1971, pp. S14918-14919. (Reprinted from August 15 Ogden, Utah, *Standard-Examiner*.)

Presents a graphic description of the Trans-Alaska Pipeline plans and progress and the environmentalists' specific objections to its construction; points out that the 2-year delay thus far caused by these objections has been worthwhile because of the environmental lessons learned in the interim; fears that Alaska may become "an economic disaster area" if the project is scrapped.

916. Aspin, L., "Dow Chemical's New Pipeline", *Congressional Record*, v. 117, no. 86, 8 June 1971, p. E5570.

Rep. Aspin describes a proposed underground pipeline system for Alaskan oil which would eliminate melting of the permafrost (of great concern to environmentalists); suggests that this system would free the Canadian pipeline route of major ecological problems and thus render it superior to the trans-Alaskan route, which is subject to earthquakes and oil spills in the ocean.

917. Aspin, L., "Why the Trans-Alaska Pipeline Should Be Stopped", *Congressional Record*, v. 117, no. 127, Part III, 6 August 1971, pp. E9062-9064. (Reprinted from *Sierra Club Bulletin*, June, 1971.)

Presents arguments against the construction of the trans-Alaska pipeline charging that the environmental-impact statement on the project failed to consider adequately the dangers of line breakage due to earthquakes, the environmental hazards of shipping oil by tanker from Valdez to the West Coast, the effects on the natives, and alternatives less hazardous ecologically.

918. Aspin, L., "The Borden Report on the Trans-Alaska Pipeline", *Congressional Record*, v. 117, no. 91, 15 June 1971, pp. H5226-5228.

Rep. Aspin reprints and discusses "A Proposal to Promote Extension of the Alaska Railroad", by the deputy director of Alaska Industrial Development Division, presenting economic arguments for building a railroad to provide 0.5 million barrels of oil a day to the west coast and a 2.5 million-barrel-a-day trans-Canada pipeline to the Chicago area, in place of the proposed trans-Alaska pipeline; the report also criticizes the manner in which Alyeska, the pipeline consortium of 7 oil companies, is organized.

## ASIA

919. Bhathal, R. S., "Science and Technical Education in Asia", *New Scientist and Science Journal*, v. 50, no. 757, 24 June 1971, pp. 729-730.

Reports on the third regional conference of ministers of education and those responsible for economic planning in Asia, dealing with measures for promoting economic, cultural, and social development through applied science and technology; emphasizes the state of science policy in Southeast Asian nations.

## ATMOSPHERIC SCIENCES

920. *National Atmospheric Sciences Program, Fiscal Year 1972, Inter-departmental Committee for Atmospheric Sciences, Federal Council for Science and Technology, ICAS Report No. 15, March 1971, 77 pp.* (Available from the Executive Office of the President, Office of Science and Technology, Washington, D.C. 20506.)

Presents program descriptions and FY 1970, 1971, and 1972 funding by Federal agencies (Departments of Agriculture, Commerce, Defense, Interior, and Transportation, and the Atomic Energy Commission, Environmental Protection Agency, National Aeronautics and Space Administration, and National Science Foundation) for research in the atmospheric sciences.

921. *World Weather Program: Plan for Fiscal Year 1972, 1971, 29 pp.* (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 50 cents.)

Describes the history and most significant activities of the Global Atmospheric Research Program; discusses the three components of the World Weather Program (World Weather Watch, Global Atmospheric Research Program, and Systems Design and Technological Development); outlines the planned U.S. FY 1972 pro-



grams and budgets for the separate activities under each of these components, showing contributions by individual Federal agencies.

922. Taubenfeld, H. J. (Ed.), *Controlling the Weather: A Study of Law and Regulatory Processes*, The Dunellen Co., Inc., New York, 1970, 275 pp. (\$10.00)

Analyzes the legal, scientific, and political problems raised by national and international modifications of the weather; surveys existing patterns of weather modification regulation at the Federal, state, and local levels; examines alternatives and presents suggestions for better serving the public interest.

923. *Project Stormfury 1971*, 15 pp. (Available from Office of Public Affairs, National Oceanic and Atmospheric Administration, Rockville, Md. 20852).

Describes Project Stormfury, which is exploring the nature and possible control of tropical storms and hurricanes; gives the project's theoretical basis, a description of the 1969 hurricane seeding experiments, plans for the 1971 season (Aug. 4 to Nov. 1), and a description of project personnel and support facilities.

924. "Man's Impact on Climate: What is Ahead?", *Science News*, v. 100, no. 5, 31 July 1971, p. 73.

Describes some of the warnings issued by the 30 meteorologists who met in Stockholm from June 28 to July 16 to discuss man's impact on the climate; noting that atmospheric pollutants, large-scale releases of heat, and changes in the earth's surface features can have catastrophic climatic effects, participants recommend the development of improved models of world climate for more accurate assessment of these effects.

925. "Is Man Changing the Earth's Climate?", *Chemical & Engineering News*, v. 49, no. 33, 16 August 1971, pp. 40-41.

Discusses man's impact on the climate; details predictions regarding the effects of emissions such as sulfates and carbon dioxide, which hamper the removal, absorption, or transfer of heat in the atmosphere.

## AUSTRALIA

926. Encel, S., "The Support of Science without Science Policy in Australia", *Minerva*, v. 9, no. 3, July 1971, pp. 349-360.

Discusses Australia's "special situation" (e.g., geographical isolation, lack of water, and little technologically sophisticated industry) which calls for a different type of national science policy than that seen in the U.S. or Great Britain; describes the history of federal support of science and research; points out a number of areas where the lack of an Australian science policy is serious.

927. "Australia, The New Member of OECD", *OECD Observer*, no. 52, June 1971, pp. 19-21.

Discusses the economic record, mineral developments, overseas trade, science, and foreign aid in Australia; describes Australia's

expanding scientific research resulting from the recent expansion of its economy and the programs of the Commonwealth Government.

## AUSTRIA

928. "Austria: Criticism of Policy Produces New Approach", *Science Policy News*, v. 2, no. 6, May 1971, pp. 71-72.

Describes the results of an analysis by a planning group in the Ministry of Science and Research to define what Austria's approach to research should be; plans call for the definition of research objectives, proposals for action to achieve those objectives, and a survey of financial resources required.

## BIBLIOGRAPHIES

929. *Index to Literature on Science of Science*, Research Survey & Planning Organization, CSIR, v. 6, nos. 11 and 12, November and December 1970, 35 pp. (Available from the Research Survey & Planning Organization, CSIR, Rafi Marg, New Delhi-1, India.)

Contains 149 references to science policy literature published during the first 4 months of 1970 in 21 journals from 6 countries (mostly U.S.), listed under 15 different headings, including agriculture, education, manpower, management, policy, industry, economic development, and society.

930. Crane, D., *Sociology of Science: Bibliography*, Spring, 1971, 27 pp. (Available from Science and Public Policy Study Group, E53-418, Massachusetts Institute of Technology, Cambridge, Mass. 02139.)

Presents an unannotated list of references under topical headings, including Introduction, Origins and Development of Science, Methods of Scientific Organization, Origins and Motivation of Scientists, Models of Scientific Growth, Problems in Social Organization of Science (9 subheads), and the Future of Science.

## BUDGET FOR SCIENCE AND TECHNOLOGY

931. "Federal R&D Expenditures Related to Budget Functions, 1960-72", *Science Resources Studies Highlights*, NSF 71-19, National Science Foundation, Washington, D.C. 20550, 24 June 1971, 4 pp.

Presents data from a forthcoming NSF report, "An Analysis of Federal R&D Funding by Budget Function, 1960-72", showing that by far the majority of Federal R&D money (85 to 90%) has consistently gone into national defense, space research and technology, and health; with the exception of space, all categories showed significant funding increases over the 12-year period.

932. "Federal R&D Funding Shows Upward Trend", *Science Resources Studies Highlights*, NSF-71-24, National Science Foundation, 7 September 1971, 4 pp. (Available from Division of Science Resources Studies, NSF, 1800 G St., Washington, D.C. 20550.)

Points out that while FY 1970 and FY 1971 Federal R&D funding are expected to be about equal (\$15.3 and \$15.4 billion, respectively), the \$16.7 billion requested for FY 1972 "marks a new high"; discusses funding obligations for basic research, applied research, development, and R&D plant over the period 1960-1972, and shows breakdowns by agencies, performers, fields of science, and states.

933. "A New R&D Numbers Game", *Science & Government Report*, v. 1, no. 13, 15 September 1971, p. 4.

Accuses the National Science Foundation of extracting "the brightest possible interpretations from statistics that reflect on the Nixon administration" in its report NSF 71-24 (Ref. 932) by implying real increases in FY 1972 Federal R&D funding, when the facts are that the requested increase is "insufficient even to keep pace with inflation" and that 76% of it is slated for the Defense Department.

934. *Federal Funds for Academic Science, Fiscal Year 1969, National Science Foundation, NSF 71-7, February 1971, 80 pp.* (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: \$1.00.)

Tabulates and discusses FY 1969 Federal obligations, as compiled by the National Science Foundation for the Committee on Academic Science and Engineering (CASE) of the Federal Council on Science and Technology to provide a statistical basis for evaluation of Federal academic science programs and allocation of Federal funds for these programs; presented in 2 parts: "Total Federal Academic Science Support" (by source of funds, type of activity, field of science, and location of institution), and "Major Types of Federally Funded Academic Science Activities" (R&D, facilities and equipment, and science education).

935. Muskie, E.S., "The Crisis in Academic Research", *Congressional Record*, v. 117, no. 127, 6 August 1971, pp. S13454-13456.

Disparages the Federal policy toward the funding of academic science, utilizing specific examples of damaging cutbacks and calling for "sufficient and predictable" growth in support of both basic and applied research — "and with management criteria that will assure continuity, rational allocation, and a better chance for the progress science can give the Nation".

936. *NASA Authorization for Fiscal Year 1972, Report of the Committee on Aeronautical and Space Sciences, U.S. Senate, Together with Additional views on H.R. 7109, Report No. 92-146, 8 June 1971, 108 pp.* (Available from the Committee on Aeronautical and Space Sciences, U.S. Senate, Washington, D.C. 20510.)

Presents the recommended budget outlays for NASA in FY 1972 which total \$3,280,850,000, with \$2,543,200,000 going to R&D, \$56,300,000 to construction of facilities, and \$681,350,000 to research and program management; describes each program and budget allowed under the bill H.R. 7109.

937. *NASA Authorization for Fiscal Year 1972, Hearings before the Committee on Aeronautical and Space Sciences, U.S. Senate, Part 1 — 30*

March and 1 April 1971; Part 2 — 2 and 5 April 1971, 1126 pp. total. (Available from the Committee on Aeronautical and Space Sciences, U.S. Senate, Washington, D.C. 20510.)

Presents (Parts 1 and 2) testimony and documents by numerous witnesses reviewing NASA's request and need for a total appropriation of \$3,271,350,000 for FY 1972; includes an index (Part 2).

938. "NSF Authorization Passed", *BioScience*, v. 21, no. 17, 1 September 1971, pp. 918-919.

Reports Congressional approval on 3 August of H.R. 7960, authorizing a compromise budget of \$655.5 million for the National Science Foundation for FY 1972 — \$33.5 million above the House's original authorization and \$51 million below the Senate's; tabulates amounts for each NSF program, major increases over Administration requests occurring in science education support, institutional support of science, and scientific research project support.

939. Peter, W. G., III, "McElroy Explains NSF Budget Stand", *BioScience*, v. 21, no. 14, 15 July 1971, pp. 775-777.

Reports on reactions to the National Science Foundation's (NSF) proposed budget, primarily in connection with the \$81 million requested for RANN (Research Applied to National Needs), which seemed to imply that NSF was shifting emphasis from basic to applied research; points out that much of the requested RANN money (\$36 million), plus \$258 million requested for "Scientific Research Support", is earmarked for basic research; questions whether a single agency should have autonomy over all federal science activity.

940. *Research and Development in Local Governments, Fiscal Years 1968 & 1969*, Surveys of Science Resources Series, National Science Foundation Report NSF 71-6, January 1971, 55 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 65 cents.)

Presents data on the nature and extent of R&D conducted by local governments during FY's 1968 and 1969, and highlights of earlier data back to 1966 [*SPR* 4(1):366], broken down by functional area, fields of science, performers, source of funds, and character of work (basic research, applied research, or development).

## CANADA

941. Doern, G. B., "Conference on 'Science Policy and Political Science' ", *SPPSG Newsletter*, v. 2, no. 6, June-July 1971, pp. 6-7.

Reports on a March 18-19 meeting of over 35 Canadian and U.S. political scientists to discuss political science aspects of science policy in Canada; describes discussions of Doern's paper on "Political Assessment" of the Senate Report on Science Policy and Gilpin's paper on "Science Policy for What?"; lists other contributors and announces availability of a compilation of the agenda and background papers from Science Council of Canada,



150 Kent St., Ottawa, Canada.

942. *Report of the President 1970-1971*, National Research Council of Canada, 94 pp. (Available from National Research Council of Canada, Ottawa, Ontario, Canada.)

Describes the Council's reorganization, information services, industrial research assistance programs, international relations, support of university research, laboratory facilities, and financial situation for FY 1970-71.

943. Parkes, J.G.M., "Canadian Strategy", *Ecology Today*, v. 1, no. 5, July 1971, pp. 6-7, 50.

Outlines Canadian federal programs which are responsible for environmental quality and points out complications stemming from divided resource-management jurisdiction between the federal government and the provinces; describes the Canada Water Act (1970), which allows the federal government to assist the provinces in water-resource management; also describes the Fisheries Act (as amended in 1970) and the Clean Air Act (1971).

944. Cooke, N. E., Cooper, R. M., and Pilon, J., *A Digest of Environmental Pollution Legislation in Canada*, compiled by Canadian Industries Ltd., and published by the Canadian Council of Resource Ministers, May 1970. (Available from Secretariat of the CCRM, 620 Dorchester Blvd. West, Room 830, Montreal 101, Quebec, Canada. Price: \$10.00 for 2 volumes: Water — 365 pp.; Air and Soil — 408 pp.)

Prepared to guide Canadian manufacturing interests in requirements to meet standards throughout the country; describes the general jurisdictions and each act or regulation passed by each of the 11 major governments: Federal, Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario, Prince Edward Island, Quebec, and Saskatchewan.

945. "Employment Prospects in Canada are Gloomy", *Chemical & Engineering News*, v. 49, no. 29, 19 July 1971, pp. 35-36.

Discusses Canada's unemployment and government actions to alleviate it, e.g., establishment of an Opportunities for Youth Program, passage of laws to control layoffs, and introduction of legislation regulating control of Canadian industry by foreign interests.

946. Hogg, B. G., "The Scale of the PhD Employment Problem — and a Partial Solution", *Science Forum*, v. 4, no. 4, August 1971, pp. 7-8.

Presents the most recent data on the employment crisis facing Canadian PhD graduates; suggests putting the foreign post-doctoral fellowship program under national control and requiring employers to give hiring preference to Canadian PhDs.

947. "Minister of Science", *Chemical & Engineering News*, v. 49, no. 34, 23 August 1971, p. 10.

Ponders the influence of A. W. Gillespie, newly appointed Minister of Science and Technology, on Canadian research programs, such as those of the National Research Council (NRC);

describes the principal duties of the Ministry.

## CHINA

948. McFarlane, B., "Mao's Game Plan for China's Industrial Development", *Innovation*, no. 23, August 1971, pp. 3-13.  
Examines government-controlled changes in industrial and technological practices in Red China; gives "ten major relationships" to explain the Chinese technology policies which are aimed largely at "grass roots" technological innovations and industry that will bring "the quickest benefits to the most people".
949. Macioti, M., "China Uses Science Policy 'to walk on two legs' ", *Science Policy News*, v. 2, no. 6, May 1971, pp. 70-71.  
Examines Communist China's educational system as it relates to its science policy, which places emphasis on applied science and technological development; outlines China's industrial policy and achievements, both economically and technologically.
950. "The Revolution in China's Laboratories", *Business Week*, no. 2190, 21 August 1971, pp. 88-89.  
Describes recent changes in the research laboratories of Red China as noted by visiting scientists who point out that Red China is doing much research in nuclear physics, electronics, and medicine and that most of this research is aimed at meeting the country's industrial and social needs.
951. Lear, J., "The Chinese Influence", *Saturday Review*, 7 August 1971, pp. 41-42.  
Suggests that May 1972 was selected as the last possible moment for President Nixon's China visit because the first United Nations Conference on the Human Environment, to be held in Stockholm in June 1972 would be a possible gateway to Red China's return to the family of nations; examines China's potential contributions to the Conference.
952. Shapley, D., "Chinese Science: What the China Watchers Watch", *Science*, v. 173, no. 3997, 13 August 1971, pp. 615-617.  
Describes information sources that observers have been using of late to report what is happening in Chinese science and scientists; presents a perspective on the Chinese Academy of Sciences and science policy as given in a June 1971 article in the Hong Kong *China News Analysis*, and other observations by China-watcher L. A. Orleans of the U.S. Library of Congress.

## COMMUNICATIONS

953. Brown, R., "Telecommunications: The Next 20 Years", *New Scientist and Science Journal*, v. 51, no. 758, 1 July 1971, pp. 13-20.  
Examines the roles of politics, big business, and science in the development of the exploding telecommunications industry (estimated at \$1000 billion in the U.S. alone by 1980); discusses the picturephone and other telephone innovations, status and developments in data transmission, evolution in radio and TV

broadcasting, and the politics of satellite communications.

954. Gunn, H. N., Jr., "New Technology for Public Communications", *Technology Review*, v. 73, no. 9, July/August 1971, pp. 24-29.

Discusses the potentials and problems (1) of the future domestic satellite system, cable television, and videocassetts "to combine effectively technology and programming to educate, enlighten, and entertain", and (2) of telecasting to smaller, more specialized audiences; proposes that an international satellite system might encourage cooperation between American broadcasting and broadcasters around the world.

955. *Communications Technology for Urban Improvement*, Report to the Department of Housing and Urban Development under Contract No. H-1221, by the Committee on Telecommunications, National Academy of Engineering, June 1971, 218 pp. (Available from National Technical Information Service, Springfield, Virginia 22151. Price: \$3.00, printed; 65 cents, microfiche.)

Reviews existing and projected types of city communications systems and suggests some pilot projects involving communications in such areas as education, health, pollution, crime prevention, emergency services, and transportation; recommends a regional development study to examine the potential of combined city communications networks — particularly for cities of the future.

## DEVELOPING COUNTRIES

956. Bhathal, R. S., "Science Policy in the Developing Nations", *Nature*, v. 232, no. 5308, 23 July 1971, pp. 227-229.

Discusses the purposes of a national science policy in developing nations: to utilize science and technology for social and economic development, to insure an adequate supply of trained scientists and technicians, to popularize science through education of the public as to its potential, and to support and encourage R&D; cites science-policy activities in Singapore as examples.

957. *Deficiencies in the Management and Delivery of U.N. Technical and Pre-Investment Assistance*, Report of a Staff Survey Team to the Committee on Foreign Affairs, U.S. House of Representatives, 25 March 1971, 50 pp. (Available from Committee on Foreign Affairs, U.S. House of Representatives, Washington, D.C. 20515.)

Discusses the findings of a study on the capacity of the U.N. system to deliver increased technical assistance and preinvestment aid over the next 2 to 3 years, which are, in part, that (1) the U.N. has no operative, integrated system for the programming, funding, delivery, and evaluation of development assistance, and (2) U.S. participation in international organizations is sparse and poorly coordinated.

958. Yudelman, M., "The Green Revolution", *OECD Observer*, no. 52, June 1971, pp. 15-18, 27-30.

Describes the "Green Revolution" as the "large scale adoption of an agricultural technology" in underdeveloped and tropical

regions; the Revolution enhances international trade, employment, and living standards; presents data on the success of the program in various countries.

## ECONOMICS AND SCIENCE

959. Lynn, J. T., "A Case for Technology", Address delivered before the Forum of the City Club of Cleveland, Ohio, 25 June 1971, 14 pp. (Reprints available from U.S. Department of Commerce, Office of the Secretary, Washington, D.C. 20230.)

The Under Secretary of Commerce discusses how this nation's technological superiority has provided economic and material advantages which can easily be lost unless government, labor, and industry cooperate to promote fuller use of technology, continued development through expanded R&D, and effective technology assessment and forecasting.

960. MacGregor, I. K., "Use of the World's Resources", Speech presented at 23rd ICC Congress, Vienna, 17-24 April 1971, *Vital Speeches of the Day*, v. 37, no. 17, 15 June 1971, pp. 525-529. (Also included in *The Vienna Papers*, Ref. 1150.)

Calls attention to the role that the International Chamber of Commerce (ICC) must play in convincing the world that "prices and profits must be relied on as the principal mechanisms of change and adjustment" to meet the current and foreseeable problems of both pollution and resource exhaustion; illustrates the effectiveness of economic incentives in 5 fields of activity related to the resource problem: conservation, substitution, processing cost, discovery, and ocean mining.

961. Brimmer, A. F., "Economic Impact of Pollution Abatement", *Congressional Record*, v. 117, no. 124, 3 August 1971, pp. E8718-8719.

Emphasizes the economic sacrifices the public must make to support an adequate pollution-abatement program to halt the destruction of the environment; presents an analysis of the general economic impact of devoting a larger share of business investment in plant and equipment to pollution abatement.

962. Quinn, J. B., "Next Big Industry: Environmental Improvement", *Harvard Business Review*, v. 49, no. 5, September-October 1971, pp. 120-131.

Contends that environmental improvement, presently considered economically distasteful, represents an "unexploited primary market" which can be profitable and add to the GNP if business leaders are willing to restructure and create new public markets for the products of environmental improvement; discusses the requirements and steps that must be taken to bring this about.

963. Gregory, W. H., "U.S. Agencies Seek Concepts to Spur R&D", *Aviation Week & Space Technology*, v. 95, no. 9, 30 August 1971, pp. 14-16.

Describes the efforts of at least 5 Federal departments or agencies to stimulate R&D and therefore develop or maintain employment and arrest the deterioration in the U.S. overall



balance of trade; quotes observations from a study by M. Boretsky, senior analyst in the office of the Secretary of Commerce, on the reasons for this deterioration.

964. Hoyt, E. P., "Fading Glamour of the Space Business", *New Scientist and Science Journal*, v. 51, no. 761, 22 July 1971, pp. 206-208.  
Names the 28 firms that had NASA contracts of over \$25 million each in 1969 and recounts the problems created by the bigness of this space business; discusses the NASA Technology Utilization Program; maintains that the space program is economically wasteful, "with billions of dollars in profits going out of the taxpayers pockets and into the hands of the space dealers"; calls for public control of space and weapons contractors.
965. Segal, G., "Has COMECON Missed the Revolution?", *New Scientist and Science Journal*, v. 51, no. 763, 5 August 1971, pp. 310-311.  
Describes the history of the Council for Mutual Economic Cooperation (COMECON), the Communist Bloc's equivalent to the Common Market plus the U.S.; COMECON has so far failed in its efforts to deal with the scientific-technical revolution, and is only now attempting to develop an economic-integration policy, the key to the success enjoyed by the West.

## EDUCATION

966. Teter, D. P., "Higher Education: Funds Rise While Basic Changes are Debated", *Science*, v. 173, no. 3994, 23 July 1971, pp. 309-311.  
Describes debates before final passage of a bill appropriating \$5.1 billion for FY 1972 to continue existing education programs, including a \$374 million increase over the FY 1971 allocation for higher education; discusses the financial crisis faced by colleges and various formulas and funding arrangements for student aid.
967. "Straws in the Wind", *Nature*, v. 232, no. 5312, 20 August 1971, p. 518.  
Points out that current U.S. legislation providing Federal aid to higher education, and scheduled to expire on July 1, 1972, supports the institution rather than the student; describes a Senate bill calling for a 3-fold budget increase (\$18 billion for 1972-75) to give each student a stipend (up to \$1400 a year) and provide direct Federal support for schools, poor and deserving students, and state student-incentive grant programs — dubbed "unrealistic" by the Administration.
968. "NSF Re-Opens Education Programs", *Washington Science Trends*, v. 26, no. 25, 27 September 1971, p. 148.  
Announces requests for proposals under the reopened Student Science Training Program (for gifted secondary-school students), the Undergraduate Instructional Scientific Equipment Program (funding instructional equipment purchases), and the Undergraduate Research Participation Program (funding research apprenticeships); for details, request E71-P-21, E71-U-2, and

E71-U-3 from Distribution Section, National Science Foundation, Washington, D.C. 20550.

969. Kormody, E. J., "Recommendations on Science in the Two Year College", *BioScience*, v. 21, no. 17, 1 September 1971, pp. 909-911. Presents the endorsed list of recommendations developed by 32 representatives from 17 organizations at the June, 1969, NSF-supported Conference on Science in the Two-Year College, dealing with matters of administration, curriculum, and personnel.
970. *Guidelines for Public Understanding of Science Program*. (Available from National Science Foundation, Office of Public Understanding of Science, 1800 G St., N.W., Washington, D.C. 20550.) Encourages proposals by universities, colleges, and independent nonprofit organizations for projects directed toward enhancement of citizen understanding of uses of science and technology in meeting problems of society; suggests that proposed programs relate to science information (books, films, exhibits, forums), training (improved science-related interdisciplinary graduate programs), and R&D (pilot studies of new approaches in public understanding of science); no submission deadline.
971. Brademas, J., "How Much Longer Should Environmental Education Wait?", *Congressional Record*, v. 117, no. 102, 1 July 1971, pp. E6867-6868. Describes the Environmental Education Act, P.L. 91-516, and the public's overwhelming response to it this past year; questions the Administration's request of only \$2 million for implementing the Act when Congress had authorized \$15 million; deplores the slow response of the Office of Education and the failure, as yet, to comply with some of the mandates of the law.
972. Muskie, E. S., "Opportunities in Environmental Careers", *Congressional Record*, v. 117, no. 113, 21 July 1971, pp. S11712-11715. Sen. Muskie presents a brochure from the College of Atlantic, committed to the broad study of the human environment and having a single curriculum; presents an article excerpted by *Saturday Review* from O. Fanning's manual entitled, *Opportunities in Environmental Careers* [SPR, 4(2):605].
973. "Columnist Spurs Formation of Ecology College", *Chemical & Engineering News*, v. 49, no. 34, 23 August 1971, pp. 34-35. Describes the transformation of Kirkland Hall College in Maryland into a college of ecology, largely through the efforts of columnist J. Anderson; discusses the ecology research center which will supplement the environmental-studies curriculum.
974. Avery, G. S., "Botanic Gardens Can Develop Environmentalists", *BioScience*, v. 21, no. 14, 15 July 1971, pp. 766-767. Points out the possibility of developing environment-conscious adults by getting children involved in nature and environmental programs; model educational programs, initiated by the Brooklyn Botanic Garden 60 years ago in cooperation with New York City's Board of Education, are described and the need for many more such centers is emphasized.

## ENERGY CRISIS

975. Slappey, S. G., "Heading Off an Energy Crisis", *Nation's Business*, v. 59, no. 7, July 1971, pp. 26-36.

Contents that there is no real energy crisis yet — only a reduction in reserve power that should be remedied within the next year by new plants and improved distribution; describes possible future energy sources — fusion, ocean tides, geothermal steam, solar heat, fuel cells, and breeder reactors; discusses individually the problems connected with each of the four common energy sources: oil, gas, coal, and nuclear power.

976. Shachtman, T., "Getting More Power to the People", *Ecology Today*, v. 1, no. 7, September 1971, pp. 47-49.

Examines the many reasons for power shortages in the U.S.; exemplifies lack of national policy and coordination by noting seven of the Federal agencies which have a hand in regulating energy supply and power diffusion; discusses the future use of magnetohydrodynamics (MHD), superconductivity, and the fusion process to increase the efficiency of conversion of energy to electricity.

977. Shachtman, T., "A Summer of Brownouts?", *Ecology Today*, v. 1, no. 5, July 1971, pp. 3-4.

Comments on a report by the Federal Power Commission, "Summer 1971 Electric Load-Supply Situation", which concludes that U.S. power companies do not have enough installed generator capacity to meet peak loads forecast for the summer of 1971; discusses objections to the "obvious solution" of building more power plants.

978. McCloskey, M., "The Energy Crisis: The Views of an Environmentalist", *Vital Speeches of the Day*, v. 37, no. 20, 1 August 1971, pp. 621-625.

Cites facts and figures indicating that present energy growth rates in the U.S. are unrealistic, environmentally damaging, and artificially induced, suggests 6 changes in public policy necessary to cope with the energy-growth problem, including: ending or reducing the incentives for energy-consumption growth, constraints to protect environmental values, promoting public understanding of the rising costs induced by the constraints, and finding ways to produce and use energy more efficiently.

979. "The Energy Crisis: Part I", *Bulletin of the Atomic Scientists*, v. 27, no. 7, September 1971, pp. 2-53.

Consists of a Foreword by Editor R. S. Lewis and 9 articles: "America's Energy Crisis: Reality or Hysteria?" by B. I. Spinrad, "Electric Power from Nuclear Fission" by M. Benedict, "Radiation Pollution of the Environment" by P. J. Lindop and J. Rotblat, "Issues in the Radiation Controversy" by A. R. Tamplin, "Nuclear Power and Ecocide: An Adversary View of New Technology" by J. W. Gofman, "Plutonium and the Energy Decision" by D. P. Greesman, "Power Generation and the Environment" by R. Eliassen, "Squaring the Infinite Circle:

Radiobiology and the Value of Life" by J. Lederberg, and "On Misunderstanding the Atom" by G. T. Seaborg.

980. "The Energy Crisis: Part II", *Bulletin of the Atomic Scientists*, v. 27, no. 8, October 1971, pp. 2-56.

Presents 5 articles on economic aspects: "New Goals for Atomic Energy" by V. L. Parsegian, "Toward a Policy of Energy Conservation" by S. D. Freeman, "The Energy Company: A Monopoly Trend in the Energy Markets" by B. C. Netschert, "Outlook for Energy in the United States" by J. D. Emerson, and "Energy Policy-Making: Limitations of a Conceptual Model" by I. L. White; presents 6 articles on technical alternatives: "Solar Power" by N. C. Ford and J. W. Kane, "Is it Time for a New Look at Solar Energy?" by A. B. Neinel and M. P. Meinel, "Underground Nuclear Power Plants" by F. C. Rogers, "Fusion Power: The Uncertain Certainty" by R. F. Post, "Notes on the Fourth Conference on Plasma Physics and Nuclear Fusion Research", and "Geothermal Energy — The Neglected Energy Option" by R. W. Rex.

981. Howles, L., "Earth's Dwindling Stock of Fossil Fuel", *New Scientist and Science Journal*, v. 51, no. 763, 5 August 1971, pp. 320-322.

Discusses the earth's shrinking supply of fossil fuels and their eventual replacement by nuclear fuels; describes the world demand for the various energy forms; discusses the high generating cost with coal and oil as fuels compared with those with nuclear and gas fuels.

982. Ehrlich, P. R., and Holdren, J. P., "The Energy Crisis", *Saturday Review*, 7 August 1971, pp. 50-51.

Suggests that future U.S. energy consumption, predicted to double every 10 years, be reduced by measures which would lessen extravagant and wasteful use of energy.

983. Pickle, J. J., "Energy Crisis Hurts Consumers", *Congressional Record*, v. 117, no. 110, 16 July 1971, pp. E7827-7828.

Rep. Pickle examines the U.S. energy-supply crisis — primarily the shortage of natural-gas reserves resulting mainly from demand for the cleanest fuel and from poor incentives for finding new reserves because of the Federally regulated low prices; presents a *Wall Street Journal* editorial (June 30) which offers similar arguments.

## ENERGY — ENVIRONMENT

984. Odum, H. T., *Environment, Power, and Society*, Wiley-Interscience, 1971, 331 pp. (\$9.95, clothbound, \$5.95, paperback.)

Presents a broad view of the world's ecosystem, discussing principles of energy and energy flow to the environment; shows diagrams depicting the flow of economic, political, and social power and how each affects the biosphere; 11 chapters, indexed.

985. Holifield, C., "Energy, Electricity and the Environment", *Congressional Record*, v. 117, no. 84, 4 June 1971, pp. H4725-4729.

Rep. Holifield discusses U.S. energy needs and examines the



availability of fuels; discusses the fast-breeder-reactor development program and the environmental effects of nuclear plants, concluding that the waste heat can be discharged without damage to the ecology and that "the low levels of radioactivity released . . . are not expected to have a perceptible adverse effect on the environment or public health and safety".

986. Wright, J. H., "The Role of Electric Power in Minimizing Total Pollution From Energy Use", *Congressional Record*, v. 117, no. 99, 28 June 1971, pp. E6660-6662.

Demonstrates analytically that substitution of electricity for other forms of energy (especially in transportation) and the utilization of waste heat from power production for space heating and certain process industries can save 10 to 15% in the total energy needs of the U.S., thereby reducing pollution — especially in urban centers; extrapolates the analysis to the year 2000.

987. Bienfang, P., "Taking the Pollution out of Waste Heat", *New Scientist and Science Journal*, v. 51, no. 766, 26 August 1971, pp. 456-457.

Discusses the possibility of using waste heat from coastal power plants to warm the nutrient-rich deep-ocean water and cause an upwelling which would carry nutrients to the surface where they would be available for marine aquaculture; presents data on the economic and nutritional values to be gained.

988. Pearson, J. B., "Helium and the Clean Energy Demand", *Congressional Record*, v. 117, no. 90, 14 June 1971, pp. S8957-8958.

Sen. Pearson comments favorably on the President's emphasis on the need for clean energy; supports programs to obtain a large supply of natural helium for use as a reactor coolant, turbine working fluid, and superconductor coolant in nuclear power systems, thereby greatly improving efficiency and reducing thermal pollution.

989. "AEC Causes Anger and Delight", *Nature*, v. 233, no. 5315, 10 September 1971, pp. 85-87.

Describes the Atomic Energy Commission's drastic new regulations covering environmental safeguards for nuclear plants, which may result in shutdown of 5 operating plants and a halt in construction of 46 plants; these moves pleased the environmentalists but evoked protests from the electric utilities companies involved.

990. Fannin, P. J., "Indians, Electric Energy and Ecology", *Congressional Record*, v. 117, no. 110, 16 July 1971, pp. S11287-11288.

Sen. Fannin contends that sorely needed economic development of the Indian Reservations of Arizona could be obtained by the construction of the proposed electric power plants in the Four Corners Region; presents two editorials from the *Phoenix Gazette* (July 5), one of which argues that the pollution threat from the Four Corners power plants "is more imagined than real".

## ENERGY — GEOTHERMAL STEAM

991. *Plowshare Geothermal: A Feasibility Study of a Plowshare Geothermal Power Plant*, prepared jointly by the American Oil Shale Corporation and U.S. Atomic Energy Commission, April 1971, 170 pp.

Explores the factors involved in using the earth's underground heat to produce steam for generating electricity and in using nuclear explosives to fracture the hot rock; identifies problems and areas where more study is necessary; includes graphical, tabular, and mathematical data analyzing systems performance and costs.

## ENERGY — NATIONAL POLICY

992. *National Fuels and Energy Policy*, Hearing Before the Committee on Interior and Insular Affairs, U.S. Senate, on S. Res. 45, 25 February 1971, 129 pp. (Available from the Interior and Insular Affairs Committee, U.S. Senate, Washington, D.C. 20510.)

Presents the text, background, testimony, and relevant documents concerning S. Res. 45, which would require the Interior and Insular Affairs Committee to make a comprehensive study of the Nation's energy resources, review the body of law and policy which influences the energy situation, and report its findings and recommendations to the Senate by 1 September 1972; indicates almost unanimous support of the resolution.

993. Coughlin, R. L., "National Energy Policy" — Parts IV and VII, *Congressional Record*, v. 117, no. 102, 1 July 1971, pp. E6912-6915, and no. 128, 8 September 1971, pp. E9309-9311.

Rep. Coughlin emphasizes the need for a coordinated national energy policy; describes the duplication and confusion arising from the independent efforts of governmental agencies and private interests to deal with the energy crisis; lists many publications on, for example, the environment, energy, technology, and energy supply, which would be helpful in forming a national energy policy.

994. Pickle, J. J., "Need for a National Energy Policy", *Congressional Record*, v. 117, no. 112, 20 July 1971, pp. E8010-8011.

Rep. Pickle points out how the economic and social well-being of the U.S. hinges directly on the constantly increasing availability of dependable energy sources; calls for prompt steps to develop a national energy policy and to provide the legislation needed to make it work.

995. Tirnan, R. O., "The President's Message Dealing with Energy Resources", *Congressional Record*, v. 117, no. 97, 23 June 1971, pp. E6435-6436.

Critically examines President Nixon's message (4 June 1971) to Congress dealing with energy resources; fears that the President's program will have such consequences as overpromotion of nuclear power and creation of an oil monopoly; calls for the Government to: (1) abolish the oil-input-quota system, (2) halt the leasing of resources on Federal lands, (3) reform and

revitalize the regulatory process, and (4) establish an independent agency to represent the interests of consumers before regulatory commissions.

996. Brooke, E. W., "The Supply of Energy", *Congressional Record*, v. 117, no. 97, 23 June 1971, pp. S9774-9775.

Sen. Brooke supports the Nixon proposal to make energy questions be the responsibility of a single Federal agency; cites the inconsistency in the Federal Power Commission's allowing the Boston Gas Co. to import large quantities of liquefied natural gas from Canada and Algeria, while the Oil Policy Committee refuses to allow increased imports of the more urgently needed No. 2 fuel oil.

997. "Powerplant Siting Act of 1971 — Amendment", *Congressional Record*, v. 117, no. 124, 3 August 1971, pp. S12922-12929.

Discusses the U.S. need for more power and more power research; presents a collection of supporting articles and bills dealing with such topics as plans to tax the use of any form of energy to raise funds for research, the use of regional generation and transmission (G&T) separate from the distribution function, and the establishment of a Federal Power Research and Development Board.

998. Harris, S., "Electric Power in the Seventies", *Congressional Record*, v. 117, no. 97, 23 June 1971, pp. E6325-6327.

Discusses the challenges facing the electric power industry, including the energy needs of the growing population, environmental-pollution control, possible shortages of fossil fuels, the huge electrical demand predicted for the future, and the increasing need for R&D; expresses confidence that the electric industry can meet these challenges.

999. Ikard, F. N., "Criticism, Policy and Reality", *Vital Speeches of the Day*, v. 37, no. 20, 1 August 1971, pp. 625-628.

Defends the energy industry, primarily the oil industry, against criticisms of environmentalists and businessmen who he feels lack basic knowledge and understanding of the industry; stresses that the U.S. needs a national energy policy to promote a strong domestic petroleum industry and to establish a system of balanced priorities, a policy developed by people having knowledge and experience in the energy field.

1000. "Senator Randolph Addresses Southern Governors' Conference on Meeting Energy Needs — Stresses Complications Due to Money and Trade Crisis", *Congressional Record*, v. 117, no. 139, 23 September 1971, pp. E9925-9927.

Reprints a summary of the September 23-24 Conference program and text of a speech pointing out how the U.S. monetary policy and 10% import surcharge is precipitating international confrontations that could affect the price and availability of needed foreign energy resources; recommends accelerated development of domestic coal reserves and a viable national energy policy.

1001. *Some Environmental Implications of National Fuels Policies*, Report

prepared by the staff of the Committee on Public Works, U.S. Senate, December 1970, 70 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 30 cents.)

Analyzes objectively the factors to be considered in developing fuels and energy policies compatible with environmental-quality requirements; presents projections as to future conditions on this earth if present fuel policies are continued; emphasizes that all pollution-abatement alternatives must be evaluated to determine those yielding the maximum cost-beneficial results.

1002. Bagge, C. E., "A National Energy Policy by the National Coal Association", *Congressional Record*, v. 117, no. 114, 22 July 1971, pp. E8185-8187.

Mr. Bagge, President of the National Coal Association, presents the coal industry's recommendations for the development of a comprehensive national energy and environmental policy: that it (1) place primary reliance on domestic sources of energy, (2) provide for coordinated efforts and thus eliminate present ambiguities and conflicts, (3) provide a more equitable distribution of Federal funds for fuel research, and (4) establish realistic goals for environmental-pollution control.

1003. Harrington, M. J., "The Need for a National Power Grid", *Congressional Record*, v. 117, no. 122, 31 July 1971, p. E8624.

Points out the advantages of a national grid system, as proposed in H.R. 9970, to make excess power existing in one region available to a region experiencing a temporary shortage.

1004. "The Role of Energy in Human Life: Past, Present, and Future", *Scientific American*, v. 225, no. 3, September 1971, pp. 36-203.

Presents 11 essays: (1) "Energy and Power" by C. Starr, (2) "Energy in the Universe" by F. J. Dyson, (3) "The Energy Resources of the Earth" by M. K. Hubbert, (4) "The Flow of Energy in the Biosphere" by D. M. Gates, (5) "The Flow of Energy in a Hunting Society" by W. B. Kemp, (6) "The Flow of Energy in an Agricultural Society" by R. A. Rappaport, (7) "The Flow of Energy in an Industrial Society" by E. Cook, (8) "The Conversion of Energy" by C. M. Summers, (9) "The Economic Geography of Energy" by D. B. Luten, (10) "Energy and Information" by M. Tribus and E. C. McIrvine, and (11) "Decision-Making in the Production of Power" by M. Katz.

## ENERGY — NUCLEAR

1005. Thompson, T. J., "Nuclear Power — Today and Tomorrow", *Chem Tech*, August 1971, pp. 495-501.

Presents a 30-year history of the development of nuclear power in the U.S.; describes some environmental disadvantages of fossil fuel power and advantages of nuclear plants; discusses the potential and problems of fusion power and emphasizes that the rapid development of fission power is urgent.

1006. Seaborg, G. T., "National Mandate for Atomic Energy: A Twenty-Five-Year Review", *AEC News Releases*, v. 2, no. 31, 4 August 1971, pp. 4-6.



Describes how the Atomic Energy Commission (AEC) has achieved the five goals set for it by the Atomic Energy Act of 1946: "improving the public welfare, increasing the standard of living, strengthening free competition in private enterprise, and promoting world peace" while "assuring the common defense and security".

1007. Seaborg, G. T., "Nuclear Energy and the Environment — Why the Controversy?", Remarks at the International Platform Association Convention, Washington, D.C., 27 July, *AEC News Releases*, v. 2, no. 30, 28 July 1971, pp. 3-9.

Supports the development of energy to bring about a new quality of life yet maintain the ecological balances that support all life; stresses that world population must be stabilized; describes the role nuclear power can and should play in providing the necessary power and safe-guarding the environment.

1008. Hosmer, C., "Nuclear Power is the Only Alternative", *Congressional Record*, v. 117, no. 102, 1 July 1971, p. E6974.

Rep. Hosmer discusses why expanded use of nuclear power is essential; emphasizes that planners of nuclear-plant construction must look ahead at least 10 years, if projected increased energy demands are to be met.

1009. "United Nations Conference on Peaceful Uses of Atomic Energy", *Atomic Energy Clearing House*, v. 17, no. 37, 13 September 1971, pp. 10-46.

Presents highlights of Dr. Seaborg's opening remarks and the following Geneva papers by U.S. authors: "Environmental Legislation" by H. K. Shapar of AEC Licensing and Regulation; "Public Acceptance" by AEC Commissioner C. E. Larson and Assistant General Manager H. C. Brown; "Breeder Program" by AEC Division Director M. Shaw; "Nuclear Plant Performance" by Commonwealth Edison Chairman J. H. Ward; "Light Water Reactor Prospects" by Bechtel's W. K. Davis; "Uranium Reserves" by AEC Division Director F. L. Faulkner; and "Uranium Enrichment" by AEC Commissioner W. E. Johnson.

1010. Hathaway, W. D., "Administration's Nuclear Power Plan Oversimplified", *Congressional Record*, v. 117, no. 90, 14 June 1971, pp. E5845-5846.

Rep. Hathaway criticizes the Administration for advocating nuclear energy as the answer to all U.S. power needs, in the face of AEC "admission" that the safety of large reactors is not assured; reprints a letter from the National Committee to Stop Environmental Pollution and a *Science* article documenting the uncertainties over the adequacy of current emergency safeguard systems.

1011. Gillette, R., "Nuclear Reactor Safety: A New Dilemma for the AEC", *Science*, v. 173, no. 3992, 9 July 1971, pp. 126-130.

Discusses the credibility gap arising between the public and the Atomic Energy Commission stemming partly from the AEC's appeals for more funds for research on nuclear-reactor safety; explains the AEC's financial woes and their seemingly paradoxical position.

1012. Till, J. E., "Science and Politics in the Controversy Over Nuclear Power Hazards", *Science Forum*, v. 4, no. 4, August 1971, pp. 3-6.  
Describes the attack on nuclear power by its opponents, for example, charges that the Atomic Energy Commission violated the National Environmental Policy Act of 1969 by failing to draft an environmental impact statement; warnings by J. S. Gofman and A. R. Tamplin, scientists at AEC's Lawrence Radiation Laboratory in Livermore, California, against the hazards of radiation and the dangers of nuclear pollution; and demands for lower maximum permissible radiation doses; questions the need for a rapid increase in electrical power.
1013. "Another SST?", *Environment*, v. 13, no. 6, July-August 1971, pp. 18-19.  
Describes the charges of the Scientists Institute for Public Information (SIPI) that the U.S. Atomic Energy Commission's proposed development program on the Liquid-Metal-Cooled Fast Breeder Reactor (LMFBR) is in violation of the National Environmental Protection Act; describes two main hazards of the LMFBR: the extremely toxic nature of the product of LMFBR, plutonium, and the possible illegal diversion of plutonium to military purposes.
1014. Mitchell, W., III, and Turner, S. E., *Breeder Reactors*, "Understanding the Atom" Series, USAEC, Division of Technical Information Extension, 1971, 47 pp. (Available from U.S. Atomic Energy Commission, P.O. Box 62, Oak Ridge, Tenn. 37830.)  
Discusses the various kinds of breeder reactors, early achievements in their development, and current development programs underway in the U.S. and abroad.
1015. "Concern Grows Over Breeder Cost Sharing", *Washington Science Trends*, v. 26, no. 16, 26 July 1971, pp. 91-92.  
Discusses the reasons for the hesitancy of U.S. power companies to invest the \$18 billion believed necessary for the AEC's breeder-reactor demonstration program; cites concerns over staking the whole future of U.S. energy on a single plant of unproven design and the serious problems and delays stemming from escalating costs, insufficient attention to quality assurance, and a lack of trained and experienced construction people.
1016. Hamilton, D., "Power from the Fast Breeder", *New Scientist and Science Journal*, v. 51, no. 766, 26 August 1971, 453-455.  
Describes Britain's plans for ensuring the operation of a commercial fast reactor (CFR) of perhaps 1300 MW before 1980; presents a short history of the development of fast reactors in Britain, U.S., and U.S.S.R.; describes the warning systems built into Britain's fast reactor.
1017. "AEC Bruised but not Cut", *Nature*, v. 232, no. 5309, 30 July 1971, pp. 290-292.  
Describes the support given by Congress to two Atomic Energy Commission programs, the Nerva nuclear-powered rocket program and Project Plowshare (the proposal to stimulate natural gas flow by underground nuclear explosions); discusses questions raised over the installation of a radioactive-waste depository in Lyons,

Kansas, and the controversy over the planned underground nuclear test (Cannikin) on the island of Amchitka.

## ENVIRONMENTAL AGENCIES

1018. Gillette, R., "Environmental Protection Agency: Chaos or 'Creative Tension'?", *Science*, v. 173, no. 3998, 20 August 1971, pp. 703-707.  
Discusses reasons for the excessive time being taken to work out the organizational details for the Environmental Protection Agency (EPA): underestimation of its complexity, physical separation of the 2000 headquarter employees in offices at 10 different locations throughout Washington, division of energies between internal organizational problems and pursuit of polluters, lack of government administrative experience by EPA officials, and shortcomings in its conceptual planning.
1019. "EPA Establishes Standing Advisory Committee for Water Programs", *Environmental News*, Environmental Protection Agency, Washington, D.C. 20460, 31 July 1971, 2 pp.  
Reports on the Environmental Protection Agency's establishment of an advisory committee comprised of the executive officers of 3 national organizations to offer the views and advice of the States and interstate agencies on EPA's programs and proposed policies and legislation, particularly its national water-quality-management programs.
1020. "Municipalities Discover EPA Efforts Overlap", *Engineering News Report*, v. 187, no. 7, 12 August 1971, pp. 14-15.  
Notes that confusing and overlapping programs to deal with environmental protection still exist, despite the Environmental Protection Agency's attempts to coordinate the efforts; describes programs being undertaken at the local level; lists some of the major Federal environmental programs and available funding for grants and loans.
1021. Chase, J., "NOAA and Oceanographic Research — Wet NASA Idea Dries Up", *Science*, v. 173, no. 3993, 16 July 1971, pp. 216-217, 220-221.  
Discusses the reasons for the lack of success of the National Oceanic and Atmospheric Administration (NOAA), the most "fundamental" one being the lack of support from the Nixon Administration; describes NOAA efforts to obtain Congressional support for an increased budget and for expansion of authority.
1022. "National Advisory Committee on the Oceans and Atmosphere", *Congressional Record*, v. 117, no. 123, 2 August 1971, pp. S12759-12760.  
Presents the amended version of H.R. 2587, which would establish a 25-member National Advisory Committee on the Oceans and Atmosphere to review the progress of marine and atmospheric science and service programs of the U.S., to advise the Secretary of Commerce with respect to the purposes of the National Oceanic and Atmospheric Administration, and to report on the status of U.S. marine and atmospheric activities.

1023. *National Institute of Ecology: An Operational Plan*, Prepared by the Ecological Society of America and Peat, Marwick, Mitchell & Co., December 1970, 42 pp. (Available from the Ecological Society of America, c/o Dr. William A. Nierling, Secretary, Connecticut College, New London, Connecticut 06320.)

Presents a detailed organizational plan and budget for a National Institute of Ecology (NIE) to conduct basic ecological research of a scope beyond the capacity of existing agencies; conduct short-term projects to find how to apply new ecological knowledge to local problems; provide an organizational framework for information resources, analytical and modeling services, taxonomic support, and field facilities and installations; develop a "Policy Research" program; and provide a channel for communication among scientists, students, and the public.

#### ENVIRONMENTAL LEGISLATION

1024. *Congress and the Nation's Environment: Environmental Affairs of the 91st Congress*, Prepared by the Environmental Policy Division, Congressional Research Service, Library of Congress, 10 February 1971, 288 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price \$1.25.)

Analyzes briefly each of the environmental bills passed or proposed in both sessions of the 91st Congress and summarizes major reports and relevant significant events, arranged by subject (e.g., air pollution, noise abatement, pesticides, energy, etc.); appendix identifies and describes each environmental bill enacted in the 91st Congress.

1025. *The President's 1971 Environmental Program*, Compiled by the Council on Environmental Quality, March 1971, 305 pp. (Available from the U.S. Government Printing Office, Washington, D.C. 20402. Price: \$2.25.)

Reprints the text of the President's February 8, 1971, environmental message to the Congress calling for measures to strengthen existing pollution-control programs, control emerging problems (poisons, noise, ocean dumping), promote environmental quality in land-use decisions, establish an Environmental Institute, and expand international efforts toward a better world environment; elaborates on each of the above specific measures, including copies of the bills, the letters of transmittal to the Congress, analyses of the proposed legislation, and several items which do not require legislation and some items for which legislation had not yet been drafted.

1026. Sax, J. L., "Environment and the Courts of Law", *Ecology Today*, v. 1, no. 7, September 1971, pp. 50-52.

Describes two important virtues of the judicial system in dealing with environmental problems: objectivity and the ability to provide the private citizen with the opportunity to initiate a lawsuit; states that the primary function of the courts in dealing with environmental matters is to "promote intelligent planning and the consideration of large, long-range issues".



1027. Sax, J. L., "Environment and the Bureaucracy", *Congressional Record*, v. 117, no. 91, 15 June 1971, pp. S9062-9063. (Reprinted from *New Republic*, 19 June.)

Refutes Administration objections to the proposed Environmental Protection Act (known as the Hart-McGovern Bill), which would allow private citizens to bring suit against anyone (citizen or corporation) who causes unreasonable pollution; discusses the Administration's own "citizen lawsuit" proposal, which Sax says "lets citizens challenge everything but what counts".

1028. "Citizens Gain Ground in Right to Sue", *Environmental Science & Technology*, v. 5, no. 7, July 1971, pp. 586-587.

Presents the background of a 1970 Michigan state law which allows private citizens to sue polluters of the environment; cites arguments for and against such laws, now being considered by over half the states and in both houses of the U.S. Congress; gives provisions of the Senate's Hart-McGovern bill, S. 1032, modeled after the Michigan law.

1029. "Establishing a Joint Committee on the Environment", *Congressional Record*, v. 117, no. 112, 20 July 1971, pp. H6901-6918.

Consists of discussions by a number of Representatives airing their views on House Joint Resolution 3, to establish a joint Committee on the Environment, and proposing several amendments; reprints the amended resolution as passed, calling for setting up a 22-man committee (11 each from House and Senate) and spelling out its organizational and operational rules and functions.

1030. Koch, E. I., "The Environmental Policy Act Amendments of 1971", *Congressional Record*, v. 117, no. 91, 15 June 1971, pp. H5260-5261.

Rep. Koch presents the text of a bill, H.R. 8984, to amend Sec. 102(2)(C) and Sec. 204 of the National Environmental Policy Act of 1969 by tightening the requirements for Federal agencies to prepare environmental-impact statements on all proposed legislation or other major Federal actions affecting the environment; among other things, the amendments require that impact statements be made public before the submission of the legislative proposals to Congress and that the Agency for International Development prepare impact statements covering its assistance programs abroad.

1031. "Bills and Amendments to Require Use of Recycled Material in Federal Procurement and Construction", *Congressional Record*, v. 117, no. 96, 22 June 1971, pp. S9615-9616.

Introduces 13 bills (S. 2111 - 2123) and 6 amendments (218-223), each amending an authorizing law or a bill, and requiring each Federal construction or procurement contract to contain a clause requiring the use of a reasonable economical percentage of recycled material; a breakdown is given of the dollar value (totalling some \$31.3 billion in FY 1972) of the Federal construction and procurement programs affected under each piece of legislation.

1032. "Statement by Bill Frenzel Before the Joint Committee on Atomic

Energy", *Congressional Record*, v. 117, no. 98, 24 June 1971, pp. H5898-5899.

Rep. Frenzel discusses the importance of his proposed bill (H.R. 7539) to amend the Atomic Energy Act of 1954 to allow states to set stricter standards on water pollution for nuclear-power-plant operation than those required by the AEC; favors an amendment extending this authority to standards for air and solid-waste pollution.

1033. "Muskie Pollution Bill Calls for \$20 Billion in Aid", *Engineering News Report*, v. 187, no. 7, 12 August 1971, p. 16.

Describes a bill approved by Sen. E. S. Muskie's subcommittee on air and water pollution which calls for \$20 billion over the next 5 years for municipal-waste-treatment grants, raises the maximum Federal share of construction costs from 55% to 75%, establishes a national minimum for water-quality standards, and allows the Environmental Protection Agency administration to obligate the full authorized funds without waiting for Congress to appropriate the money.

1034. Humphrey, H. H., "Senate Resolution 134 — Submission of a Resolution Relating to the Impoundment of Funds for Environmental Protection", *Congressional Record*, v. 117, no. 88, 10 June 1971, pp. S8834-8835.

Sen. Humphrey introduces S. Res. 134 which would direct the President to release approximately \$400 million previously appropriated for programs and projects to better the environment and conserve natural resources; questions the constitutionality of the Administration's withholding of the funds.

#### FACILITIES FOR R&D

1035. Rosen, L., "Relevance of Particle Accelerators to National Goals", *Science*, v. 173, no. 3996, 6 August 1971, pp. 490-497.

Discusses the relationship of particle accelerators to the achievement of national goals; presents an inventory of the world's supply of particle accelerators, of which the U.S. owns about half, and describes the importance of these accelerators to industry, medicine, and the applied sciences.

1036. Anderson, P., "Are the Big Machines Necessary?", *New Scientist and Science Journal*, v. 51, no. 767, 2 September 1971, pp. 510-513.

Contends that the race to develop higher and higher energy particle accelerators is unwise, and sees no valid excuse for a disproportionate economic and intellectual effort to support the "not particularly vital or successful" field of high-energy physics.

1037. "Facilities Acquisition — NASA", Hearing before the Subcommittee on NASA Oversight of the Committee on Science and Astronautics, U.S. House of Representatives, No. 6, 18 June 1971, 49 pp. (Available from U.S. House of Representatives, Committee on Science and Astronautics, Washington, D.C. 20515.)

Reviews "NASA's current policies and procedures concerning the acquisition of capital plant"; includes statements by NASA Maj.

Gen. R. H. Curtin (USAF Ret.) Director, Office of Facilities, and Mr. B. Moritz, Deputy Associate Administrator, Office of Organization and Management, and Chairman, Facilities Management Review Committee.

## FOREIGN AFFAIRS

1038. Rogers, W., "Growing Ties Between Science and Foreign Policy", *Department of State Bulletin*, v. 64, no. 1668, 14 June 1971, pp. 776-778.

Discusses the significant role of science and technology in promoting communication between the U.S. and other governments, such as Russia and Mainland China; cites examples involving international technological relationships — e.g., the environmental crisis, assistance to developing nations, and communications satellites.

1039. *Report to the Congress: Need for Improved Review and Coordination of the Foreign Affairs Aspects of Federal Research*, Report of the Comptroller General of the United States, General Accounting Office, 27 May 1971, B-171564, 97 pp. (Available from the U.S. General Accounting Office, 441 G St. N.W., Room 6417, Washington, D.C. 20548. Price: \$1.00.)

Reviews the management of foreign-relations aspects of U.S. Government research performed in foreign countries or bearing on foreign affairs; stresses the need for improved coordination; recommends that domestic agencies seeking foreign research projects be required to submit summaries of their proposed projects to the State Department to avoid adverse effects on foreign relations.

1040. *A General Review of International Cooperation in Science and Space*, Hearings before the Subcommittee on International Cooperation in Science and Space of the Committee on Science and Astronautics, U.S. House of Representatives, No. 4; 18, 19, 20 May 1971, 359 pp. (Available from U.S. House of Representatives, Committee on Science and Astronautics, Washington, D.C. 20515.)

Presents documents and testimony offered during 3 days of public hearings to review the nature and extent of existing international cooperative science and space programs, to examine the roles of the various U.S. Government agencies involved, to analyze problems and obstacles encountered, and to consider prospects for future cooperative ventures with foreign nations.

1041. *The AID Research Program: 1962-1971*, Agency for International Development, 1971. (Single copies available from Distribution Branch, Room B927, Agency for International Development, 2201 C St., N.W., Washington, D.C. 20520.)

Gives a brief description, contractor, principal investigator, AID monitor, and purpose of each of 142 projects active or completed under AID's centrally sponsored research program; foreword points out that because Western research methodology and findings cannot always be transferred to developing countries, the AID program is stressing collaboration between the U.S. and

scientists and institutions in the developing countries.

## FRANCE

1042. "France: A Ministry for the Environment", *Science Policy News*, v. 2, no. 6, May 1971, p. 72.

Describes the purpose and recent efforts of the Ministry for the Protection of Nature and the Environment, operating with a budget of F. 91.55 million, to better the environment; mentions that an Interministerial Committee chaired by the Prime Minister is also responsible for supervision of environmental matters, particularly in water management.

## GOVERNMENT-SCIENCE INTERACTION

1043. *Science and Government Report*, a twice-monthly newsletter. (Available by subscription from Science and Government Report, P.O. Box 21123, Kalorama Station, Section A, Washington, D.C. 20009. Price: \$25.00/year in the U.S. or \$35.00/year overseas.)

Concentrates on news and analysis of science-policy affairs in Washington; published by Daniel S. Greenberg, former news editor of *Science* and author of *The Politics of Pure Science*.

1044. Daddario, E. Q., "Technology and the Democratic Process", *Technology Review*, v. 73, no. 9, July/August, 1971, pp. 19-23.

Speculates that the inefficiency of the democratic process, in contrast to the efficiency demanded by technology, is the basis for their incompatibility; describes dilemmas posed by, e.g., changing views on economic growth and the U.S.'s basic political creed and the differing criteria of importance held by the technological community and the public; questions whether science and technology can be employed on an ever-increasing scale while retaining a democratic form of government.

1045. Kaysen, C., "Government and Scientific Research — Some Unanswered Questions", *The Public Interest*, no. 24, Summer 1971, pp. 80-85.

Discusses the U.S. Government's stance toward R&D and academic science as reflected in the increased FY 1972 budget, coupled with a new emphasis on applied research; calls attention to the correlation between public attitudes toward science and Federal science policy; discusses determinants in level and distribution of support for academic science and the organization of Federal Government R&D support.

1046. "U.S. Government Approach to R&D", *Science Policy News*, v. 3, no. 1, July 1971, pp. 5-6.

Presents suggestions by Nixon's Science Adviser, David, concerning organization of Federal R&D within Nixon's proposed new 4-department Administration (Human Resources, Natural Resources, Economic Development, and Community Development); calls for an Assistant Secretary for R&D within each Department, with each doing its own R&D, while the Executive Office would set goals and spearhead planning.



1047. Eads, G., and Nelson, R. R., "Governmental Support of Advanced Civilian Technology: Power Reactors and the Supersonic Transport", *Public Policy*, v. 19, no. 3, Summer 1971, pp. 405-427.

Expounds on 4 features that the development programs for the civilian SST and the breeder power reactor have in common and that the authors consider "steps in the wrong direction": (1) unprecedented massive government subsidy to develop a commercial civilian item; (2) advocacy largely from within government, with no pressing "need"; (3) lack of a persuasive, explicit rationale; and (4) posing of basic questions of industrial R&D strategy and institutional structure.

1048. "Department of Science and Technology Unlikely", *Astronautics & Aeronautics*, v. 9, no. 7, July 1971, pp. 9-10.

Presents arguments for and against the establishment of a Cabinet-level Department of Science and Technology; points out that bills providing for such a reorganization (Sen. Montoya's S.1184 and a similar bill by Rep. Runnels) are now as far in the legislative process as bills of that type have ever been, but predicts that they will probably fail.

1049. Califano, J. A., Jr., "The Separate but Unequal Branch — Congress Has Been Bypassed in Analytical Technology", *Congressional Record*, v. 117, no. 108, 14 July 1971, pp. S10915-10917. (Reprinted from *Washington Post*, 13 July 1971.)

Maintains that the poor status of Congress as compared with the executive branch is due chiefly to its own shortcomings: it has ignored the revolution in analytical technology (use of computers on substantive policy issues), Congressional staffs have limited capability, and the committee structure of Congress "no longer conforms to the realities of American life".

1050. *Technical Information for Congress*, Report to the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics, U.S. House of Representatives, 92d Congress, prepared by The Science Policy Research Division, Congressional Research Service, Library of Congress, Revised 15 April 1971, 845 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: \$3.50.)

Issued first in 1969 [SPB 2(4): p. 30], this report has been expanded and updated to better reflect "the processes involved in congressional decisions on scientific issues"; to the original 14 case studies of technical issues faced by Congress, 4 new technology assessments are added: the AAAS review of herbicide use in Vietnam, water fluoridation, the supersonic transport, and the electric automobile; a new appendix covers research in high-energy physics and includes an annotated bibliography on technology assessment.

1051. Cairncross, A., "Government and Innovation", *New Scientist and Science Journal*, v. 51, no. 767, 2 September 1971, pp. 502-505.

Discusses the steps a government can take to accelerate technological development; urges measures to stimulate technological innovation.

1052. *Revised Memorandum and Statement of Government Patent Policy*, 24 August 1971, 21 pp. (Available from Executive Office of the President, Office of Science and Technology, Washington, D.C. 20506.)

Announces revisions in U.S. Government patent policies to provide greater commercial utilization of patents and inventions stemming from Federal R&D programs, by permitting the various agencies to grant more ownership or exclusive-use licenses.

1053. Sapolsky, H. M., "Science Policy in American State Government", *Minerva*, v. 9, no. 3, July 1971, pp. 322-348.

Discusses the evolution of the U.S. Government-science relationship into the "new federalism", under which important Federal Government decisions are based on counsel from science advisory committees rather than on judgments of political officials; discusses the role of the Federal Government in state science foundations; describes limitations of the present state advisory committees, and offers suggestions for enhancing their position in the future.

1054. Peter, W. G., III, "Science and Political Power", *BioScience*, v. 21, no. 15, 1 August 1971, pp. 14-15.

Describes the unification of U.S. scientists into potentially politically influential groups because of what they consider misuses of their trade: defoliation, pesticides, and depletion of natural resources, for example; discusses problems scientists face in expressing their views at Congressional hearings, a necessary step if they are to influence national policy.

1055. Ezrahi, Y., "The Political Resources of American Science", *Science Studies*, v. 1, no. 2, April 1971, pp. 117-133.

Discusses the increasing inseparability of American science and politics; analyzes four categories of political visibility of science and the consequences of differences in political visibility and resources among different fields of science, particularly since the decline in Federal funding and public support; calls attention to a new, developing political orientation of American scientists, manifested in a shift from basically free political competition to restrained competition and linked to areas of public concern and popular technologies, fostered by multidisciplinary scientific bodies like the NAS, NSF, and AAAS.

1056. Brown, H., "Herman Cohn in Retrospect", *The Futurist*, v. 5, no. 4, August 1971, pp. 157-159.

Emphasizes dramatically the need to recognize and do something about problems before they become unmanageable and the need for greater communication between the scientific and legislative communities; recounts the great frustration of the fictitious Herman Cohn who, in the early 1900's, predicted problems the automobile would create and could not get anyone to do anything about it.

## HEALTH

1057. Kennedy, E. M., "Modern Improvements in Hospital Care", *Congres-*

*sional Record*, v. 117, no. 96, 22 June 1971, pp. S9644-9646.

Describes some of the improvements made in health care in modern hospitals; reprints S. Ferber's article, "The High-Technology Hospital: Better Care, Lower Cost", from *Medical Economics* (March 1), which describes innovations for eliminating nursing stations, integrating communications, and mechanizing or automating the distribution of supplies — all of which result in better patient care at lower cost.

1058. Schwartz, W. B., "Medicine and the Computer — The Promise and Problems of Change", *Congressional Record*, v. 117, no. 99, 28 June 1971, pp. S10022-10026. (Reprinted from *New England Journal of Medicine*, 3 December 1970.)

Examines the changes that will be effected in health care from advances in the information sciences, primarily computer science; describes how the computer will probably augment and take over many of the physicians' intellectual tasks; states that new interactions must take place among the medical profession, information sciences, and management sciences, and that health-care-system policy makers must develop new skills and attitudes.

1059. Rogers, J. G., "Dr. Billy Jack Bass: 'He's Helping to Make Medical History'", *Congressional Record*, v. 117, no. 111, 19 July 1971, pp. S11402-11403. (Reprinted from *Parade*, July 11, 1971.)

Describes the Automated Physician's Assistant project, developed by the Missouri Regional Medical Program, which is making available to doctors in rural areas computers for diagnostic purposes, thus providing them with advantages normally available only in big medical centers and guaranteeing better treatment for their patients.

1060. *John E. Fogarty International Center for Advanced Study in the Health Sciences*, 1971, 14 pp. (Available from George E. Presson, Executive Officer, Fogarty International Center, Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Bethesda, Md. 20014.)

Describes the Center, established as a tribute to the late Rep. Fogarty and charged with providing "an environment where scientists, scholars and leaders from related fields can explore and appraise biological and medical developments and their implications for man and society", on an international scale.

1061. *National Institutes of Health Annual Report of International Activities, Fiscal Year 1970*, 147 pp. (Available from the John E. Fogarty International Center for Advanced Study in the Health Sciences, Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, Bethesda, Md. 20014.)

Describes the activities and programs of NIH in furthering international cooperation in biomedical research; lists the international awards made in the forms of research grants, fellowships, collaborative research agreements, and support of international conferences.

1062. "WHO: 1972 Budget", *Science Policy News*, v. 3, no. 1, July 1971, p. 16.

Notes the \$82 million 1972 budget for the World Health Organization, an increase of 9.05% over the 1971 budget; lists objectives of the approved long-term program on the human environment, including improvement of worldwide environmental health and sanitation, promotion of international agreement on criteria regarding known environmental influences on health, and extension of knowledge on environmental-factors effects on human health.

## INFORMATION MANAGEMENT

1063. Collier, H. R., "Federal Research Programs and a Proposal for a National Research Data Bank", *Congressional Record*, Part I: v. 117, no. 86, 8 June 1971, pp. E5544-5551; Part II: no. 87, 9 June 1971, pp. E5640-5650, Part III: no. 89, 11 June 1971, pp. E5729-5740.  
Explains the importance and necessity of a National Research Data Bank to coordinate and serve as a national repository for all information and data from Federally funded R&D (over \$17 billion in FY 1972), as proposed in H.R. 8732; presents tabulations of the budgets for and short descriptions of the FY 1970, 1971, and 1972 Federal research programs for each individual department and agency.
1064. "A Study of Environmental Quality Information Programs in the Federal Government: Summary and Committee Recommendations", *Congressional Record*, v. 117, no. 127, Part II, 6 August 1971, pp. E8971-8973.  
Summarizes the Study of Environmental Quality Information Programs (SEQUIP); contends that the proposed National Environmental Data Bank is unrealistic, e.g., it would be a competitor to the very agencies that it must depend on for input; presents 10 recommendations, notably that a National Environmental Protection Information and Data Services (NEPIDS) be organized with the EPA to achieve coordination among environmental agencies and avoid duplication of effort; further recommendations concern actions and supplementary services to support NEPIDS.
1065. "EDS Named Lead Agency for Management of Data Gathered in International Decade of Ocean Exploration", *U.S. Department of Commerce News*, National Oceanic and Atmospheric Administration, Washington, D.C. 20230, NOAA 71-113, 11 August 1971, 2 pp.  
Describes some plans and projects of the Environmental Data Service (EDS), which was just named lead agency for U.S. data management in the International Decade of Ocean Exploration (IDOE); the EDS will coordinate data from the National Oceanographic Data Center, the National Geophysical Data Center, and the National Climatic Center.
1066. "Interfoundation Study Group", *Science Policy News*, v. 2, no. 6, May 1971, p. 76.  
Reports that representatives of 6 research foundations — from Italy, Sweden (2), U.S.A., Switzerland, and England — met in Stockholm in April and agreed to form a study group to pro-



mote an Interfoundation Information Centre; the Centre's purpose is to "improve communications between grant-making organizations and research bodies; lists the Committee membership; relevant information is to be published in *Science Policy News*.

## JAPAN

1067. Jequier, N., "Towards a Technological Policy: the Japanese Model", *Science Policy News*, v. 3, no. 1, July 1971, pp. 1-5.

Defines technological policy as "a synthesis of science policy and industrial policy" and lists some of the Japanese government bodies that implement it on both sectoral and global levels; discusses its 3 main elements in terms of the Japanese experience: (1) well-defined long-term objectives, (2) criteria for measuring success, and (3) political and technical ability to implement it; presents 6 "strategic questions" upon which Japan has based its technological policy.

1068. "Physics in Japan: Budgets Still Meager Despite Economic Boom", *Physics Today*, v. 24, no. 8, August 1971, pp. 69-71.

Compares the Government funding for basic research in Japan with that of other countries such as the U.S. and U.K.; describes the problems in obtaining more funds for basic research, such as the political gap between scientific community and the Diet and the general public's lack of appreciation and understanding of science; fears that the environmental crisis and the looming military budget escalation will further inhibit basic R&D funding.

1069. "Japan: Government Finance for Science", *Science Policy News*, v. 2, no. 6, May 1971, pp. 72-73.

Gives Japan's proposed FY 1971 budget for governmental expenditures in education and science as a record £1,270 million, of which £352 million will go for R&D; indicates that R&D support by the private sector should more than double the latter figure; points out that 172,000 Japanese were engaged in research in 1969.

1070. "How Many People?", *Scientific American*, v. 225, no. 1, July 1971, pp. 43-44.

Discusses reasons for the steadily decreasing rate of growth in Japan's population and the problems that the economy faces if the fertility rate continues to drop; a shortage of young workers already exists, and concerns are expressed that eventually the population will actually diminish.

## LAND USE

1071. Pyles, H. K. (Comp.), *What's Ahead for Our Public Lands?*, A Summary Review of the Activities and Final Report of the Public Land Law Review Commission, 1970, 343 pp. (Available from Natural Resources Council of America, 709 Wire Bldg., Washington, D.C. 20005. Price: \$3.50, paperback.)

Part 1 contains 10 independent reviews of the Public Land Law Review Commission's report and recommendations to the President of the U.S.; Part 2 contains a number of independent reviews of study reports made for the PLLRC; Part 3 contains reports made to the Executive Committee of the Natural Resources Council on the 11 meetings of the PLLRC; a 29-subject index shows where such topics as Dominant Use vs Multiple Use, Fish and Wildlife, Land Use Planning, Outer Continental Shelf, and Water Resource are discussed.

## LIFE SCIENCES

1072. "NASA Life Scientist Research Program", *BioScience*, v. 21, no. 16, 15 August 1971, p. 871.

Describes a Life Scientist Program, recommended by the National Academy of Sciences, in which university faculty and their graduate students will be appointed to do relevant work at NASA's centers; the program is designed to involve university life scientists in studies and research related to NASA missions.

## MANAGEMENT OF SCIENCE

1073. Soltanoff, L., "The Innovation Myth", *Industrial Research*, v. 13, no. 8, August 1971, pp. 44-46.

Examines the innovation crisis in American industry, its effects, and the reasons behind it: chiefly, American industry's reluctance to risk new-product ventures and the discouragement stemming from present engineering-education concepts; calls for creation of new forms and goals for engineering education, and suggests that corporations develop new attitudes toward creative talent and adopt new bases for evaluating new-product programs.

1074. *Industry Funded Research and Development*, Aerospace Industries Association, June 1971, 10 pp. (Available from Aerospace Industries Association, 1725 DeSales St., N.W., Washington, D.C. 20036.)

Argues that Independent Research and Development (IR&D) and Bid and Proposal (B&P) efforts by industry are vital to the progress and security of the U.S. and should therefore not be hampered by external controls; contends that IR&D and B&P costs, which are included in the selling price of goods and services, are controlled "in a natural way" by the competitive marketplace without artificial external controls.

1075. Roy, R., "Applied Research Needs New Funding Scheme", *Chemical & Engineering News*, v. 49, no. 32, 2 August 1971, pp. 12-17.

Discusses the status of applied research in the U.S., and presents a detailed proposal for a new agency, the National Applied Science and Engineering Foundation (NASEF), which would be self-supporting and would reorient U.S. R&D management to counter foreign competition.

1076. "NSF Staff Out of Touch?", *Nature*, v. 231, no. 5304, 25 June 1971, p. 486.

Discusses criticisms in an internal memorandum, composed at the request of the National Science Foundation's deputy director, alleging that the NSF lets its professional staff members "grow out of touch with their field of science" because of overemphasis on administrative skills; the memorandum also charges that there is "too much supervision and poor internal communication".

1077. Cohn, V., "Shaking Up The System", *Technology Review*, v. 73, no. 9, July/August 1971, pp. 8-9.

Supports the efforts of the "new critics" to force a change in emphasis of technology from "technology for technology's sake" to "science for the people"; cites the barriers to achieving this; suggests that the American legal system, public opinion, technology assessment, and informed debate are powerful tools for effecting a transformation.

## MANPOWER, TECHNICAL AND SCIENTIFIC

1078. *Federal Spending and Scientist and Engineer Employment*, Bulletin 1663, U.S. Department of Labor, Bureau of Statistics, 1970, 46 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 50 cents.)

Discusses the conceptual problem in measuring the Government's effect on the employment of scientists and engineers and the sources and nature of available manpower and expenditure data; presents estimates of Federally supported employment in the extramural sectors and direct employment in the Federal Government.

1079. *Scientific Activities of Independent Nonprofit Institutions, 1970, Report on a Survey of 1970 Employment and 1969 Expenditures, Surveys of Science, Resources Series, National Science Foundation Report NSF 71-9, February 1971, 63 pp.* (Available from the U.S. Government Printing Office, Washington, D.C. 20402. Price: 70 cents.)

Presents the employment breakdown among scientists, engineers, and technicians, the total expenditures, and the intramural R&D performance of research institutes, Federally funded R&D centers administered by nonprofit organizations, voluntary hospitals, and others such as technical societies and private foundations.

1080. Fanning, O., "Jobs for the Well-Being of People", *Ecology Today*, v. 1, no. 7, September 1971, pp. 12-14.

Describes the many job opportunities which the emerging environmental-management industry is expected to provide; groups environmental management into 5 major fields of activity: ecology, earth sciences, resources and recreation, environmental design, and environmental protection; discusses the education and manpower situations in these areas.

1081. Tribus, M., "The Paradox of Engineering Unemployment", *Astronautics & Aeronautics*, v. 9, no. 8, August 1971, pp. 15-17.

Tells what must be done to resolve the crisis the U.S. is witnessing because it is not utilizing and developing the tech-

nology it has available; states that the highest priority must be assigned to developing a new generation of scientists and engineers who are conscious of the effects of their work on society.

1082. "House Explores Unemployed Scientists Problem", *Chemical & Engineering News*, v. 49, no. 28, 12 July 1971, pp. 32-33.

Discusses Government efforts to do something about the 50,000 to 65,000 unemployed U.S. scientists and engineers, including proposed legislation to re-educate them for other jobs and to tide them over with low-interest, long-term loans; lists 8 Administration actions (mostly by the Department of Labor) already taken.

1083. Brode, W. R., "Manpower in Science and Engineering, Based on a Saturation Model", *Science*, v. 173, no. 3993, 16 July 1971, pp. 206-213.

Examines the problem of a surplus of science-oriented graduates, noting the increase in the total number of graduates; emphasizes the need to develop a "holding pattern" for today's scientists to create a reserve for the years 1980-1990, wherein the demand is projected to exceed the supply.

1084. *Occupational Manpower and Training Needs*, Bulletin no. 1701, Stock No. 2901-0656. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 75 cents.)

Presents data from the U.S. Department of Labor's study which predicts major increases in the national requirement for engineers and scientists in engineering and in physical, environmental, and life sciences by 1980 — increases of, respectively, 40%, 22.7%, and 41% from the 1968 employment figures.

1085. "Engineers Trapped by Shifts to New Priorities", *Chemical & Engineering News*, v. 49, no. 26, 28 June 1971, pp. 12-13.

Summarizes discussions at a conference on engineering employment sponsored by the National Society of Professional Engineers, covering the need for a national manpower policy, the pros and cons of economic conversion and retraining, prognosis for 1980, and future engineering curricula.

1086. "More Engineer Retraining Studied", *Aviation Week & Space Technology*, v. 95, no. 10, 6 September 1971, pp. 14-15.

Describes the limited success of the U.S. Labor Department's program for providing job-location grants, moving grants, and retraining grants to help unemployed scientists and engineers qualify for new jobs.

1087. Lepkowski, W., "Where Will All the Young Men Go?", *Science Forum*, v. 4, no. 4, August 1971, pp. 15-16.

Discusses the bleak job picture for U.S. scientists and engineers; describes the position of the administration in dealing with the problem; predicts these trends will continue unless "solid policies are developed for turning R&D toward commercial markets".

1088. "Unemployment Rates for Scientists, Spring 1971", *Science Resources Studies Highlights*, National Science Foundation Report NSF 71-26, 2 July 1971, 4 pp.

Presents the results of an NSF survey of the employment status



of about half of all U.S. scientists as of the spring of 1971; results, tabulated by field of science, highest degree, age group, and geographical area, show 2.6% unemployment among scientists, compared with 1.5% in spring 1970.

1089. "Unemployment Rate for Engineers, June-July 1971", *Science Resources Studies Highlights*, National Science Foundation Report NSF 71-33, 23 September 1971, 4 pp.

Presents the results of a survey of the employment status of about 5% of all engineers in the U.S. as of mid-1971; results, tabulated by field of specialization, highest degree, age group, and geographical area, show 3.0% unemployment among engineers, compared with 1.6% in spring 1970.

1090. *Summary Report 1970: Doctorate Recipients from United States Universities*, National Research Council, Report OSP-MS-4, March 1971, 9 pp. (Available from the Office of Scientific Personnel, National Research Council, 2101 Constitution Ave., N.W., Washington, D.C. 20418.)

Summarizes data gathered from a Survey of Earned Doctorates during FY 1970 in numerous specialized fields under 7 major headings: Physical Sciences, Engineering, Biological Sciences, Health Sciences, Social Sciences, Arts and Humanities, Professional Fields, and Education; data show that 14.4% more Ph.D.'s were granted in FY 1970 than in 1969, and that 78.9% planned to enter regular employment following graduation — mostly (70%) in educational institutions.

1091. *Scientific Manpower: A Dilemma for Graduate Education*, MIT Press, 28 Carleton St., Cambridge, Mass., 1971, 180 pp. (\$6.95).

Consists of an edited and reconstructed summary of discussions at a May 1970 Symposium on The Supply, Need and Utilization of Graduate Scientists and Engineers; shows "the necessity for universities to restructure their graduate programs toward a much greater sensitivity to society's utilization of the products of their educational programs".

1092. Terman, F. E., "Supply of Scientific and Engineering Manpower: Surplus or Shortage?", *Science*, v. 173, no. 3995, 30 July 1971, pp. 399-405.

Discusses the reasons for the current surplus of Ph.D.'s and predicts a shortage in the future if there is no reexamination and reorientation of both the curriculum of and attitudes toward the Ph.D. degree; presents many graphs showing numerical trends in baccalaureate degrees in science and engineering since the early 1950's.

1093. Wolfe, D., and Kidd, C. V., "The Future Market for Ph.D.'s", *Science*, v. 173, no. 3999, 27 August 1971, pp. 784-793.

Examines the variability and reliability of assorted projections of the supply and utilization of Ph.D.'s and the effects of these projections on policy decisions; discusses the effects of the overabundance of Ph.D.'s on their employment status and a few ways to decrease this overabundance: early retirement and more work in social, health, and environmental fields.

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1094. Dalton, G. W., and Thompson, P. H., "Accelerating Obsolescence of Older Engineers", *Harvard Business Review*, v. 49, no. 5, September-October 1971, pp. 57-67.

Analyzes the major findings of a study of the performance of 2,500 design and development engineers in 6 organizations; examines the relationships between age, salary, ranking, and performance; suggests a creative approach to continued education as a means of combatting the deterioration in engineers' performance with age.

## METRICATION

1095. *U.S. Metric Study Report International Standards*, U.S. Department of Commerce, National Bureau of Standards, Interim Report, NBS SP 345-1, December 1970, 157 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: \$1.25.)

Calls attention to the importance of international standards to the international transfer of technology and goods; presents 9 conclusions and 5 recommendations for immediate action, reflecting a substantial concern about the need to strengthen U.S. effectiveness in international standards activities; appendixes identify the Metric Study Group and Panel, present the Metric Study Act, Charter, and Plan, discuss engineering standards, and show assorted questionnaires being used in the Metric Study; final report is described below.

1096. De Simone, D. V., *A Metric America — A Decision Whose Time Has Come*, Report NBS-SP-345, 30 July 1971, 188 pp. (Available from the U.S. Government Printing Office, Washington, D.C. 20402. Price: \$2.25.)

Discusses the results of 3 years of studies, surveys, and analyses by the Commerce Department's National Bureau of Standards, leading to the recommendation that the Congress initiate a systematic, nationally coordinated changeover to the metric system of measurement over a 10-year period; appendixes detail how the studies were made, present a selective bibliography including 12 volumes of detailed special reports on hearings and supplemental surveys, and reproduce an International Standards Organization recommendation on units of the International System (SI).

## MEXICO

1097. "The National Council for Science and Technology", *Mexican Newsletter*, Office of the President, separata 2, 15 pp. (Available on request from *Mexican Newsletter*, Palma 40-50. piso, Mexico 1, D.F., Mexico.)

Describes the reasons for the creation of the Mexican National Council for Science and Technology; discusses the effects of science and technology on Mexican progress and science policy; describes the Council's initial program and its role in promoting international cooperation to assist in bringing advanced technology to Mexico.

## MULTINATIONAL SCIENCE ACTIVITIES

1097. Skolnikoff, E. B., "Technology and the Future Growth of International Organizations", *Technology Review*, v. 73, no. 8, June 1971, pp. 39-47.

Presents a "partial survey of developments in technology and their side effects over the next 10 to 20 years, for the purpose of laying out the international political functions that each technical prospect implies"; deals in general with environmental control, use of the Oceans, and exploitation of outer space, and the worldwide regulatory tasks presented by each.

1098. Jahsman, W. H., "Toward a European Scientific Power", *Technology Review*, v. 73, no. 8, June 1971, pp. 10-12.

Describes a number of organizations which have evolved from inter-European scientific efforts, such as CERN (nuclear research), ESRO (space exploration), and the Anglo-French SST, as well as a number of professional societies; blames the heterogeneous nature of the European educational system and national loyalties for preventing "runaway growth" of this type of cooperation.

1099. "Aigrain Projects Persist", *Nature*, v. 232, no. 5311, 13 August 1971, p. 538.

Describes plans for a Pan-European conference of ministers in Brussels in November 1971, following a September meeting to settle organizational and financing matters and pave the way for planning a series of collaborative research projects; notes that the European Community has dropped certain "ambitious projects" from consideration, including the development of a large computer, telecommunications research, and nuclear-reactors studies.

1100. "Nuclear Energy in Europe", *Nature*, v. 232, no. 5308, 23 July 1971, pp. 211-212.

Describes the plans of a Nuclear Power Group of five European companies for bringing more nuclear energy to Europe; discusses problems experienced by this group and Britain's own nuclear program in deciding which type of nuclear reactor they should support.

1101. "What Future for Euratom?", *Nature*, v. 232, no. 5307, 16 July 1971, p. 146.

Discusses failure of the European Atomic Energy Community (Euratom) "to arrange for seemly collaboration in nuclear power development on a European basis" and points out that there is little incentive for Britain to belong to Euratom, though the U.K. is about to become a member of the European Economic Community; points out that the Euratom safeguards system to keep track of nuclear materials within the member countries is a most valuable activity, but needs to be made "clearer and simpler".

1102. Sandgreber, J., "Nuclear Industry: Chance to Build a 'New Euratom'", *New Scientist and Science Journal*, v. 51, no. 761, 22 July 1971, pp. 189-192.

Discusses the problems of Euratom that arose because none of the 6 member countries was prepared to surrender its own national program, but a "new Euratom" is being formed whose R&D efforts will be concentrated on atomic-energy fields of interest to all partners, without encroaching on any one country's domain of commercial exploitation.

1103. "Meeting South of the Border", *Science*, v. 173, no. 3998, 20 August 1971, p. 708.

Announces a 3-week meeting of scientists from all countries of the Western Hemisphere, sponsored by the AAAS and Mexico's Consejo Nacional de Ciencia y Tecnologia, to be held in Mexico City in July 1973; mentions plans to discuss special fields of science for 2 weeks and interdisciplinary problems the third.

## NATIONAL DEFENSE

1104. Doty, P., "The Community of Science and the Search for Peace", *Science*, v. 173, no. 4001, 10 September 1971, pp. 998-1002.

Establishes the relationship between science and peace; describes scientific relations between the U.S. and U.S.S.R. and the 20 Pugwash conferences on science and world affairs held since 1957; assesses the Strategic Arms Limitations Talks (SALT).

1105. "Unreordered Priority", *Scientific American*, v. 225, no. 1, July 1971, pp. 42-43.

Summarizes a report by the U.S. Arms Control and Disarmament Agency indicating that world arms expenditure reached a record peak of \$204 billion in 1970, though its percentage of the total world GNP declined; warns that an accelerated arms race could be concealed behind a decline in the ratio of arms spending to the GNP with a rapidly growing economy.

1106. Dyson, F. J., "Arms Control and Technological Change", *Congressional Record*, v. 117, no. 125, Part II, 4 August 1971, pp. E8788-8791.

Examines two opposing views regarding the basis for arms-control decisions: one favoring the technological feasibility or desirability basis, the other favoring the political basis; cites specific arms problems to support the belief that the latter leads to sounder decisions.

1107. Klass, P. J., "Recon Satellite Assumes Dual Role", *Aviation Week & Space Technology*, v. 95, no. 9, 30 August 1971, pp. 12-13.

Describes the first of the new generation of U.S. strategic reconnaissance satellites, "Big Bird", launched on June 15, which are capable of both search-and-find and close-look procedures, processes previously requiring two different spacecraft.

1108. "Ban on Biological Weapons", *Congressional Record*, v. 117, no. 127, Part II, 6 August 1971, pp. S13734-13735.

Sen. Muskie presents the text of the U.S.-Soviet Draft Convention on Elimination of Bacteriological Arms; calls attention to the fact that although the treaty bans only the use of biological weapons, Article 8 obligates each party to negotiate in good faith



on effective measures for banning chemical weapons.

1109. Gravel, M., "Protest Against Scheduled Cannikin Nuclear Test", *Congressional Record*, v. 117, no. 135, 17 September 1971, pp. S1444-14451; and no. 139, 23 September 1971, pp. S14930-14932. Alaska's Sen. Gravel presents 16 recent editorials and articles expressing sentiments against the scheduled underground atomic weapons test, citing all the arguments for cancellation and urging President Nixon to be wary of AEC assurances that the risks are small; includes discussions of secrecy of EPA recommendations, concern by other nations (notably Canada), and effects on U.S. disarmament talks with Russia.
1110. McGovern, G. S., "The Cannikin Test", *Congressional Record*, v. 117, no. 112, 20 July 1971, pp. S11635-11640. Sen. McGovern describes three possible consequences of the Atomic Energy Commission's detonation of a 5-megaton nuclear device more than 5,000 feet below the surface of Amchitka island off Alaska (the Cannikin test): earthquakes, tsunami (or tidal waves), and radioactive contamination of air and water; presents a critique, prepared by the Coalition to Stop the Alaska Nuclear Blast, of the AEC's environmental-impact statement on Cannikin and an article which documents the dangers of underground testing in general.

#### NORWAY

1111. *Norway: Reviews of National Science Policy, Organisation for Economic Co-operation and Development*, 1970, 194 pp. (Available from OECD Publications Center, Suite 1207, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006. Price: \$4.75.) Book 1 (135 pp.) describes Norway's geography, natural resources, population, government, economy, scientific activities (organizations and national policy), and R&D activities (history, institutional framework, industrial research, and personnel education and utilization); Book 2 (38 pp.) discusses industrial R&D, agriculture, forestry, fisheries, national goals, science policy, organization of research, and the national economy.
1112. "Norway: Proposals to Reorganise Research Structure", *Science Policy News*, v. 2, no. 6, May 1971, pp. 73-75. Discusses report No. 4 of the Central Committee for Norwegian Research entitled "the Organisation of Research in Norway", which emphasizes the importance of clear administrative lines responsive to user's needs, and effective cooperation among the 4 organizational levels: Research Institute, Research Council, Ministry, and Government; discusses each of these levels.

#### OCEAN - INTERNATIONAL ACTIVITIES

1113. "Seabed Arms Control Treaty Transmitted to the Senate", *U.S. Department of State Bulletin*, v. 65, no. 1677, 16 August 1971, pp. 185-187.



U.S. Secretary of State Rogers describes a treaty submitted for Senate ratification, calling for "the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and Ocean Floor and in the Subsoil Thereof"; signed by 62 countries, including the U.S., the U.K., Northern Ireland, and the U.S.S.R., on 11 February 1971.

1114. Stevenson, J. R., "Legal Regulation of Mineral Exploitation in the Deep Seabed", presented at Offshore Technology Conference, Houston, Texas, April 19, 1971, *U.S. Department of State Bulletin*, v. 65, no. 1672, 12 July 1971, pp. 48-55.

Discusses the latest U.S. policy on the oceans and their resources, in view of the great strides in technological capability to exploit them - and the "diffusion of political power among newly independent states with nationalist economic ambitions with regard to the potentials of the oceans"; describes the responsibilities of the proposed International Seabed Resource Authority.

## OCEAN - POLLUTION

1115. Loftas, T., "Mediterranean Pollution - Another Year of Neglect", *New Scientist and Science Journal*, v. 51, no. 760, 15 July 1971, pp. 144-145.

Describes the serious Mediterranean pollution problem stemming from the influx of sewage, oil, and industrial effluents; reports on discussions at the Pacem in Maribus 2 meeting in Malta calling for joint action by the Mediterranean states to stop the deterioration.

1116. Magnuson, W. G., "Navigable Waters Safety and Environmental Quality Act of 1971", *Congressional Record*, v. 117, no. 92, 16 June 1971, pp. S9172-9173.

Introduces a bill (S. 2074) which would aid in the protection of the environmental quality of ports, waterfront areas, and navigable waters of the U.S.; the bill is aimed at the prevention of environmentally devastating oil spills through tough new standards for construction, maintenance, and operation of tankers and through scrutiny and control of vessel traffic patterns to decrease collision risks.

1117. "Marine Protection Research and Sanctuaries Act of 1971", *Congressional Record*, v. 117, no. 128, 8 September 1971, pp. H8183-8199, and no. 129, 9 September 1971, pp. H8225-8255.

Presents House discussion, under H. Res. 554, of H.R. 9727, to regulate the dumping of material in the oceans, coastal, Great Lakes, and other waterways; Title I provides for regulation of and transportation for the dumping of materials; Title II authorizes a research program on ocean dumping; Title III authorizes designation of intrusion-free "marine sanctuaries"; H.R. 9727 was finally passed by the House, 304 to 3.

## OCEAN - U.S. ACTIVITIES

1118. Hollings, E. F., "A Sound Oceans Program", *Congressional Record*, v.

117, no. 118, 27 July 1971, pp. S12193-12194.

Sen. Hollings points out the advantages (rich resources, utilization of idle technical and creative talent, maintaining technological superiority) of "a comprehensive, well-funded oceans program"; presents a *Washington Post* article (July 18) that argues that the U.S. and Russia could both reap "unimagined rewards" by diverting their resources from space to the oceans.

1119. Doumani, G. A., *Science, Technology, and American Diplomacy: Exploiting the Resources of the Seabed*, prepared for the Subcommittee on National Security Policy and Scientific Developments of the Committee on Foreign Affairs, U.S. House of Representatives, July 1971, 152 pp. (Available from U.S. House of Representatives, Committee on Foreign Affairs, Washington, D.C. 20515.)

Gives geographical and legal concepts of the continental shelf and describes seabed resources and the technology and economics of recovering them; discusses the "go-slow" policy of exploitation of seabed petroleum and minerals, U.N. interests and U.S. participation in international ocean activities, and the role of science and technology in seabed diplomacy; contains 14 appendixes presenting relevant data and describing pertinent legislation.

1120. "Ocean Science Plans", *Washington Science Trends*, v. 26, no. 2, pp. 117-118.

Desc. National Oceanographic and Atmospheric Administration's new program directed toward a national capability to work in the sea; lists seven broad goals including such newcomers as undersea weather forecasts and development of undersea recreation facilities; describes the projects being considered for the east and west coasts; lists 9 developments needed to raise man's underwater performance level.

1121. "NOAA Awards \$1.4 Million Sea Grant to Texas A & M", *United States Department of Commerce News*, U.S. Department of Commerce, Washington, D.C. 20230, NOAA 71-128, 3 September 1971, 2 pp.

Describes the program of education, research, and advisory services in marine ecology and management at Texas A&M University which has just received a \$1.4 million sea grant from the Commerce Department's National Oceanic and Atmospheric Administration.

1122. "University of Wisconsin Receives Million Dollar NOAA Sea Grant", *United States Department of Commerce News*, U.S. Department of Commerce, NOAA, Washington, D.C. 20230, NOAA 71-130, 8 September 1971, 2 pp.

Describes the Sea Grant Program at the University of Wisconsin which has just received a \$1 million grant from the Commerce Department's National Oceanic and Atmospheric Administration (NOAA) to explore methods for effective management of the marine and coastal environment of the upper Great Lakes, conduct an underwater-minerals program, examine water-quality standards, and study the economics of year-round use of the St. Lawrence Seaway.



1123. *The Ocean Science Program of the U.S. Navy: Accomplishments and Prospects*, 1970, Office of the Oceanographer of the Navy, 99 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: \$1.00.)

Describes the history, objectives, projects, and facilities of the Navy Ocean Science Program, which spent \$61 million of the \$245 million Navy Oceanographic Program budget for FY 1970; appendixes include a glossary of terms and brief descriptions of the 41 research ships and the 24 academic institutions in the Program.

## PERSONALITIES

1124. Lindsay, S., "Cleanup Man Maurice Strong", *Saturday Review*, 7 August 1971, pp. 43-47.

Presents the life story of M. Strong, U.N. Secretary General and Undersecretary General of the Conference on the Human Environment at Stockholm in 1972, and the events which resulted in his taking the U.N. positions.

1125. Shapley, D., "Mike McCormack: A Potential 'Mr. Science' Comes to Congress", *Science*, v. 173, no. 3995, 30 July 1971, pp. 408-410.

Describes freshman Rep. McCormack, a Democrat from Washington state with B.S. and M.A. degrees in chemistry, assigned to the House Committee on Public Works and the Science and Astronautics Committee; cites McCormack as favoring a "judicious" and "critical" rein on military spending, the Cannikin nuclear test, the SST, MIRV, and large growth of the National Science Foundation, while opposing the anti-ballistic missile system (ABM).

1126. Wade, N., "NSF Official Resigns Protesting Science Education Cuts", *Science*, v. 173, no. 4002, 17 September 1971, p. 1109.

L. G. Humphreys, Assistant Director for Education of the National Science Foundation, cites cutbacks in funding, withholding by the Office of Management and Budget of \$30 million of Congressionally appropriated educational and institutional support funds, and the threat of losing NSF's education programs to the Office of Education (the latter denied by NSF Director McElroy) as his reasons for resigning to resume teaching psychology at the University of Illinois.

## PHILIPPINES

1127. Hermano, R.A.D., "Some Notes on the National Science Policy of the Philippines", *Philippine Science Review*, v. 11, no. 2, March-April 1970, pp. 13-20.

Points to the indifference of Philippine national decision makers to science, and discusses the inadequacy of R&D expenditures (0.2% of GNP in 1964), the proportionately low share borne by the Government (54%), the proliferation of Government research-oriented agencies competing for funds, and the education and distribution of the inadequate supply of technical manpower.

1128. Medina, F. A., "Science, Technology and Education in a Developing Philippines", *Philippine Science Review*, v. 11, no. 5, September-October 1970, pp. 3-7.

Chairman Medina of the National Science Development Board characterizes the concept of development in the Philippines as growth plus a social and cultural change and a change in attitude; describes the programs, legislation, and educational systems that have been established by the Philippines to foster development through science and technology.

1129. Cortes, J. R., "Education and Scientific Development in the Philippines", *Philippine Science Review*, v. 11, no. 3, May-June 1970, pp. 13-19.

Delves into the importance of science to a developing country like the Philippines and the vital role of education in fostering scientific advancement; attributes the lack of scientific atmosphere, the shortage of competent scientists and engineers, the shortage of qualified science teachers, and the backward science education programs to failure of the Philippine educational system to stress scientific education; makes 5 recommendations for remedying these deficiencies.

1130. Salcedo, J., Jr., "Invention, Technology and Economic Development", *Philippine Science Review*, v. 11, no. 5, September-October 1970, pp. 14-17.

Salcedo, President of the Science Foundation of the Philippines and Chairman of the National Research Council, suggests that Philippine industry and R&D laboratories try some techniques of forecasting (Delphi Model, lookout institutions, or scenario), and "Ideas Generation", so as to establish a link between the inventor and industry; the aim is to transform the traditional Filipino agricultural society into an agro-industrial one through research and inventions.

1131. Santillan, F. L., "The Frustrations of a Filipino Research Scientist", *Philippine Science Review*, v. 11, no. 4, July-August 1970, pp. 17-21.

Discusses the frustrations of the creative Filipino research scientist, attributed to (1) limited support by the Government for research scientists, (2) limited utilization of products from research or invention by industry, and (3) limited acceptability of researches and inventions by the public; makes 6 recommendations for promoting the industrial application of R&D results.

## POLICY-MAKING BODIES

1132. Cohn, V., "The 'House of Lords' of Science", *Technology Review*, v. 73, no. 8, June 1971, pp. 8-9.

Discusses the position of the 900-member National Academy of Sciences (NAS), currently under Nader-instigated scrutiny by Science reporter P. M. Boffey, because of "elitism, over-secrecy, and conflict of interest" by its numerous committees and study panels; calls attention to recent NAS moves directed toward improving the public image of the Academy and of science (e.g., no more "buryable" Academy reports, admission of more

behavioral and social scientists, and improving quality control of Academy work).

1133. Holmfeld, J. D., "Personnel Changes at OST", *SPPSG Newsletter*, v. 2, no. 6, June-July 1971, pp. 4-6.

Discusses recent turnovers in senior positions in the White House Office of Science and Technology: Deputy Director H. B. Heffner's return to Stanford, Special Assistant to the Director R. Barlow's departure for Cornell, Energy Policy Staff Director S. D. Freeman's leaving for the University of Pittsburgh, and the replacement of E. Ward as Executive Secretary of the Federal Council for Science and Technology by L. A. Goldmuntz; lists the 16 active FCST committees and their chairmen.

1134. "Institute of Medicine Begins Its Work, Raises Membership to 108", *News Report, NAS/NRC/NAE*, v. 21, no. 6, June-July 1971, pp. 11-12.

Mentions initial plans announced by President Hogness of the new Institute of Medicine of the National Academy of Sciences to examine the implications of "universal entitlement" to health care and of "death with dignity", as well as the relationships between nursing education and medical education; lists the members, recently increased to 108 from the charter group of 29.

1135. "National Commission on Materials Policy", *Congressional Record*, v. 117, no. 115, 23 July 1971, pp. S11909-11911.

Presents nominations for the 7-man National Commission on Materials Policy and reviews the history and purpose of its formation in 1970 to make considered recommendations on the supply, use, recovery, and disposal of materials; includes the text of Title II of Public Law 91-512 which created the Commission, and the portion of Senate Report 91-1034 which discusses its role and scope.

## POLLUTION — AIR

1136. *Cleaner Air For The Nation, The Report of the President's Task Force on Air Pollution*, August 1970, 35 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 30 cents.)

Presents 63 recommendations for restoring and preserving U.S. air quality, focusing on problems considered most urgent; discusses findings under the headings General Considerations, Mobile Source Emission Control, Stationary Source Emission Control, Biological Effects, Analytical Methods and Instrumentation, and Meteorological Problems and Considerations; notes that "major improvements in air quality cannot be secured without substantial increases in expenditures".

1137. Aspin, L., "Economic Incentives to Curb Air Pollution", *Congressional Record*, v. 117, no. 98, 24 June 1971, pp. H5899-5900.

Introduces and points out the advantages of a bill which would place a tax of 5c/lb on sulfur oxides and other particulate



emissions from stationary sources, thus incorporating an economic incentive to control pollution.

1138. "Regulations to Control Auto Pollution Announced", *Environmental News*, Environmental Protection Agency, Washington, D.C. 20460, 30 June 1971, 8 pp.

Announces issuance of final standards for permissible emissions of carbon monoxide, hydrocarbons, and nitrogen oxides, along with testing procedures to be used to measure compliance of 1975-76 cars with the Clean Air Act of 1970; includes a background paper containing major features of the regulations as published in the June 29 *Federal Register*.

1139. "EPA Issues Report on Auto Emission Controls", *Environmental News*, Environmental Protection Agency, Washington, D.C. 20460, 14 July 1971, 3 pp.

Gives highlights of the EPA's first annual report to the Congress on the development of systems to reduce auto emissions, indicating that U.S. automakers are spending over \$330 million a year for R&D on emission control, that meeting the 1975 standards is feasible at a price increase of \$80 to \$600 per car with unleaded gasoline, and that achievement of the 1976 standard requires technology beyond the present state of the art.

1140. "Pollution Control and the Auto Industry", *Congressional Record*, v. 117, no. 85, 7 June 1971, pp. S8409-8410.

J. J. Piccardo, President of the Chrysler Corp., discusses the extremely strict 1975 standards for exhaust emissions by automobiles in the U.S., and contends that they overcompensate for our ignorance of the effects of emissions on the environment; urges free exchange of all relevant information and employment of the most direct and effective approaches to the problem.

1141. Orski, K., "The Impact of the Automobile on the Environment", *OECD Observer*, no. 53, August 1971, pp. 31-35.

Outlines the complex problems posed by the widespread use of the motor vehicle, discussing such matters as safety, emissions, noise, economics, mass transit, restraints on auto use, disposal of scrap vehicles, and international implications of moves to make motor vehicles more compatible with the environment; presents statistics on "the state of motorisation in OECD countries" in 1970.

## POLLUTION — INTERNATIONAL COOPERATION

1142. *A Reader in International Environmental Science*, prepared by the Environmental Policy Division, Congressional Research Service, Library of Congress, Serial B, May 1971, 160 pp. (Available from U.S. House of Representatives, Committee on Science and Astronautics, Washington, D.C. 20515.)

Reviews results of the 1-month, interdisciplinary Study of Critical Environmental Problems (SCEP) on a global basis; presents specific recommendations for action to reduce the harmful effects of pollution; presents papers discussing the role of



science in dealing with the environment and international cooperation for global environmental improvement.

1143. *International Environmental Science*, Proceedings of the Joint Colloquium before the Committee on Commerce, U.S. Senate, and the Committee on Science and Astronautics, House of Representatives, 25-26 May 1971, 241 pp. (Available from the U.S. Senate, Committee on Commerce, Washington, D.C. 20510.)

Contains numerous statements and documents by authorities dealing with the status, needs, and opportunities of international environmental science; appendixes cover biographies of participants, details of S. Res. 399 to create a World Environmental Institute, information on the 1972 United Nations Conference on the Human Environment, environmental problems in India, and a taxonomy of international environmental problems.

1144. Russell, C. S., and Landsberg, H. H., "International Environmental Problems — A Taxonomy", *Science*, v. 172, no. 3990, 25 June 1971, pp. 1307-1314.

Categorizes international environmental problems into two groups: (1) physical-linkage problems, which concern all nations either as pollution contributors or receivers, and (2) social-linkage problems in which the environmental action of one nation affects the "well-being of citizens of one or more other nations"; explains dimensional variations in international environmental problems.

1145. Wilson, T. W., Jr., *International Environmental Action: A Global Survey*, The Dunellen Company, Inc., New York. 1971. 361 pp. (\$12.50)

Assesses the reactions of institutions around the world to the sudden public realization that the environment needs attention — based on a survey under the Aspen Institute for Humanistic Studies and the Anderson Foundation that led to the formation of the International Institute for Environmental Affairs; delves into society-science interactions and current efforts to deal with the crisis; includes 175 pages of appendixes describing relevant documents and organizations, and 60 pages of annotated bibliography.

1146. McClory, R., "International Conference on Problems of the Environment", *Congressional Record*, v. 117, no. 87, 9 June 1971, pp. E5620-5621.

Rep. McClory describes the International Parliamentary Conference on the Environment, which he attended, designed to lay the groundwork for the U.N. Conference on the Human Environment, to be held in Stockholm in June 1972; lists high-priority present and emerging environmental problems and proposals for their solution.

1147. Gude, G., "Cleaning a Dirty World", *Congressional Record*, v. 117, no. 102, 1 July 1971, pp. H6319-6320.

Rep. Gude presents an editorial which contends that because pollution is global in scope, political and national aspirations

must be set aside; otherwise international efforts will be fruitless and the U.N. Conference on the Human Environment in Stockholm may be a failure; presents a letter which confirms that U.S. policy parallels the opinion of the editorial.

1148. "OECD and the Environment", *OECD Observer*, no. 53, August 1971, pp. 19-26.

Outlines the reasons for concern by the Organisation for Economic Co-operation and Development with environmental problems as they affect economic and social development, the steps the OECD is taking to deal with these problems, and the methods it employs; describes the OECD Environmental Committee and its 4 Sector Groups (Air Management, Chemicals in the Environment, Water Management, and Urban Environment), as well as its 3 Ad-Hoc Groups (Pollution by Motor Vehicles, Stationary Fuel Combustion, and Pulp and Paper Industry).

1149. "A New Form of International Cooperation: The Problem of Persistent Chemicals", *The OECD Observer*, no. 52, June 1971, pp. 10-11.

Describes the early notification plan, in which member countries of the Organisation for Economic Co-operation and Development inform one another about prospective changes in certain environmental regulations; announces the establishment of OECD's Environment Committee of a Sector Group to identify potentially hazardous substances, to study methods for reducing their occurrence, to estimate the costs and likely effects of the various alternatives, and to propose concerted action among Member countries.

1150. *The Vienna Papers*, U.S. Council Participation in the 23rd Congress of the ICC on Technology and Society: A Challenge to Private Enterprise, Vienna, 17-24 April, 1971, 64 pp. (Available from U.S. Council of the International Chamber of Commerce, 1212 Avenue of the Americas, New York, N.Y. 10036. Price: \$1.25.)

Contains introductory remarks and conclusions of the Congress, as well as a background report by Sir Solih Zuckerman and papers on use of the world's resources (see Ref. 960), social costs of economic growth, responsibilities of government and industry, technology and developing countries, and international cooperation in environmental control; the general theme running through the papers is the need for international action and in particular for a dominant role by the ICC to promote international standards in pollution control and represent international business in a vigorous campaign for protection and renewal of the environment.

1151. Hollings, E. F., "International Parliamentary Conference on the Environment", *Congressional Record*, v. 117, no. 92, 16 June 1971, pp. S9235-9237.

Discusses the objectives of the International Parliamentary Conference on the Environment held in Bonn on June 2-4, 1971; presents the text of a motion passed by the Conference, defining environmental problems on a three-priority basis; first-priority recommendations include the initiation of international negotia-

tions to establish strict pollution controls and coordinated international and national environmental research programs sponsored by the United Nations system.

1152. Gardner, R. N., "U.N. as Policeman", *Saturday Review*, 7 August 1971, pp. 47-50.

Examines the objectives of the U.N. Conference on the Human Environment to be held in June 1972 in Stockholm; describes the consensus reached at a meeting held between the Institute on Man and Science and the Aspen Institute of Humanistic Studies in Rensselaerville, N.Y., which emphasized the complexity of the International community which the Stockholm Conference will be dealing with.

1153. Kashiwa, S., "United States-Japan Cooperation on Environmental Quality", *Congressional Record*, v. 117, no. 102, 1 July 1971, pp. H6327-6329.

Describes the specific pollution problems facing both the U.S. and Japan; discusses the results of the U.S.-Japan Conference on Environmental Quality held in Japan in October 1970.

#### POLLUTION – MERCURY

1154. Dunlap, L., "Mercury: Anatomy of a Pollution Problem", *Chemical & Engineering News*, v. 49, no. 27, 5 July 1971, pp. 22-23, 26, 30, 33-34.

Presents the first of two articles examining the reasons, extent, impact, and possible solutions of the mercury-pollution problem; concludes that Government and industry must "work together with increased candor and effectiveness" if other similar crises are to be avoided.

#### POLLUTION – NOISE

1155. Meyer, A. F., Jr., "Noise Abatement: Newest Federal Environmental Program", *Professional Engineer*, v. 41, no. 7, July 1971, pp. 33-34.

The Acting Director of EPA's Office of Noise Abatement & Control calls attention to the growing noise-pollution problem and what is being done about it; mentions his current programs on causes and effects of noise pollution, ecological implications, compilation of existing laws and ordinances related to noise, and identification of criteria for standards setting.

1156. Ryan, W. F., "The Fanfare of Technology: Noise", *Congressional Record*, v. 117, no. 94, 18 June 1971, pp. E6166-6167.

Presents an antinoise legislation package (H.R. 6984 through 6991) which would expand the authority of the EPA's Office of Noise Abatement and Control, specify stringent fines, provide for citizen suits, provide for the setting of more stringent standards by states, and require equipment manufacturers to include noise levels on name tags; reprints an article on "Noise Legislation" from *Sound and Vibration* (May) which describes legislation by Federal and State governments (notably California) to fight noise pollution.

1157. Haas, A. D., "Noise Pollution", *Congressional Record*, v. 117, no. 84, 4 June 1971, pp. E5439-5441. (Reprinted from Kiwanis magazine.)  
Dwells on the increasing seriousness of noise pollution in the U.S. and obstacles to corrective action — a primary one being failure of significant numbers of average citizens to campaign for noise control; describes some noise-abatement measures taken by various cities and the Federal Government, but contends that much more is needed and presents a few suggestions in this direction.
1158. Hatfield, M. O., "Effects of Excessive Noise on American Household", *Congressional Record*, v. 117, no. 96, 22 June 1971, pp. S9674-9675.  
Sen. Hatfield points out how the noise level in U.S. homes has risen to the point where it is interfering with family life and psychological well-being; reprints an article from the *Washington Evening Star* (21 June), "The Din Hits Home", which reinforces this argument and Sen. Hatfield's claim that the Noise Control Act of 1971 (S. 1016) is needed.
1159. Ryan, W. F., "Noise and the Worker", *Congressional Record*, v. 117, no. 85, 7 June 1971, pp. 5541-5542.  
Rep. Ryan discusses the need for greater noise-level controls in industry than those advanced by the new Occupational Safety and Health Act (P.L. 91-596) and introduces legislation, the Occupational Noise Control Act of 1971 (H.R. 6990 and 6991), which would direct the Secretary of Labor to enforce more stringent noise-exposure limitations; reprints the new regulations on noise exposure and an article on the dangers of on-the-job noise.
1160. "Metropolitan Aircraft Noise Abatement Policy Study, John F. Kennedy International Airport", *Congressional Record*, v. 117, no. 90, 14 June 1971, pp. E5783-5786. (Reprint of report prepared by the Tri-State Transportation Commission of New York.)  
Examines aircraft noise and its abatement near John F. Kennedy Airport; recommends the installation of noise mufflers on commercial aircraft engines as soon as possible, rapid development of NASA's "quiet engine" for commercial aircraft, halting further residential construction by zoning or the acquisition of land near the noisiest areas, altering the New York State's building code to require soundproofing, and offering financial incentives for soundproofing to owners of existing structures.

## POLLUTION — PESTICIDES AND HERBICIDES

1161. Dahlsten, D. L., and Garcia, R., "Pesticides", *Ecology Today*, v. 1, no. 5, July 1971, pp. 39-42.  
Contends that the solution to the pesticide problem lies in the approach, not the technique; discusses the U.S. "overreliance" on pesticides and alternatives to chemical control of insects.
1162. Wurster, C., "Effects of Insecticides", *Congressional Record*, v. 117, no. 119, 28 July 1971, pp. E8333-8337.



Examines the effects of the chlorinated hydrocarbons (e.g., DDT and Endrin) on the ecology by looking at their effects on birds, fish, and humans; suggests replacing persistent insecticides by "integrated control techniques" (setting up a single, unified pest-management system integrating biological, chemical, and other effective measures), and continuing imaginative and unbiased research.

1163. McElheny, V. K., "Insects: Progress Toward Hormonal Control", *Technology Review*, v. 73, no. 9, July/August 1971, pp. 12-13.

Summarizes the progress made during the past 3 years on the development of hormone insecticides; discusses the need for a change in philosophy toward insecticide use.

1164. "EPA Asks Study of Pesticides in Food Handling", *Environmental News*, Environmental Protection Agency, Washington, D.C. 20460, 21 August 1971, 3 pp.

Describes the history, functions, and membership of EPA's Hazardous Materials Advisory Committee, which has recently been assigned the task of recommending policy guidelines for registering pesticides for use in food-handling establishments.

1165. "Agricultural Chemicals Fall Foul of Nader's Raiders", *Nature*, v. 232, no. 5308, 23 July 1971, pp. 216-217.

Discusses the findings of a task force, reported by H. Wellford of Ralph Nader's Center for Study of Responsive Law, which uncovered a wealth of alleged malpractices and shortcomings in the machinery and Federal agencies which enforce meat-quality standards.

1166. "EPA to Speed Release of Scientists' Reports on Pesticides", *Environmental News*, Environmental Protection Agency, Washington, D.C. 20460, 28 July 1971, 2 pp.

Announces that the EPA will make public the scientific advisory committee reports filed under the Federal Insecticide, Fungicide, and Rodenticide Act as soon as they are received; describes procedures that registrants may follow to appeal or reverse the cancellation or suspension of the registration of a pesticide.

1167. "Conflicting Philosophies Over 2,4,5-T", *Nature*, v. 231, no. 5304, 25 June 1971, pp. 483-485.

Discusses recommendations by a scientific committee appointed by the EPA at the request of Dow Chemical and Hercules to reexamine the need for restrictions on the use of the herbicide 2,4,5-T; the majority report recommends that all restrictions on 2,4,5-T be lifted, but that certain limits be placed on the lethal by-product dioxin and that research on dioxin buildup be continued; dissenting arguments in a one-author minority report are presented, and the practical and political aspects of the debate are discussed.

1168. Fulbright, J. W., "The Geneva Protocol of 1925", *Congressional Record*, v. 117, no. 110, 16 July 1971, pp. S11325-11326.

Sen. Fulbright objects to Pentagon efforts to get the Administration to "phase down" instead of "phase out" the use of chemical

herbicides in Vietnam, thereby allowing limited but continued use; presents a *Washington Post* article (July 3) giving Pentagon arguments for the change and opponents' arguments against it.

## POLLUTION — PROBLEMS AND CONTROL

1169. *The President's 1971 Environmental Program — Emerging Problems*, The Domestic Council, Executive Office of the President, 1971, 15 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 30 cents.)

Presents Nixon's proposals for dealing with environmental problems, including measures to control toxic substances, ocean dumping, and noise pollution, and for recycling wastes; discusses the proposals for establishing a World Heritage Trust to protect parks and reserves and an Environmental Institute to carry on organized research on the environment.

1170. *U.S. National Report on the Human Environment*, Prepared by Department of State for June 1972 United Nations Conference on Human Environment in Stockholm, Sweden, June 1971, 53 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 40 cents.)

Describes, briefly, the environmental problems in the U.S. and existing and proposed actions being taken to solve them; indicates actions that the U.S. believes merit international attention, grouped into 3 categories: acquisition and dissemination of knowledge, formulation of environmental policies, and prerequisites for concerted action.

1171. *Report to The President and to The Council on Environmental Quality*, prepared by Citizens' Advisory Committee on Environmental Quality, 1700 Pennsylvania Ave., N.W., Washington, D.C. 20006, April 1971, 56 pp.

Summarizes the results of in-depth studies of particular environmental problems by 6 subcommittees seeking fresh and innovative approaches; makes specific recommendations relative to land and energy use and pollution; discusses environmental education, citizen responsibility, goals, and funding.

1172. "Report of the Council on Environmental Quality — Message from The President", *Congressional Record*, v. 117, no. 127, 6 August 1971, pp. S13613-13615; no. 128, 8 September 1971, pp. H8180-8182; and no. 131, 13 September 1971, pp. E9483-9486.

Presents the Second Annual Report of the Council on Environmental Quality which recommends that institutions be reformed so as to obtain coordinated management and protection of our natural resources and environment, that all Federal decision making take into account environmental protection, and that environmental protection be carried out on an international level; presents measures for dealing with present and emerging pollution problems.

1173. *The Quest for Environmental Quality, Federal and State Action*,



1969-70, *Annotated Bibliography*, Advisory Commission on Intergovernmental Relations, April 1971, 63 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 35 cents.)

Describes legislative and administrative measures taken by Federal and State governments to control and protect environmental quality; includes an annotated bibliography, covering politics, policies, and programs, as well as specific environmental areas of concern (air, power, shore protection, waste disposal, water, and noise).

1174. Fadiman, C., and White, J. (Eds.), *Ecocide . . . And Thoughts Toward Survival*, The Center for the Study of Democratic Institutions, Box 4446, Santa Barbara, Calif. 93103, 1971, 202 pp. (\$5.95)

Contains ten selections concerned with the environment ranging from critical studies of where we went wrong to constructive approaches on how environmental preservation can be achieved; taken from materials prepared for the academic program of the Center for the Study of Democratic Institutions by authors H. Wheeler, P. R. Erlich, J. P. Holdren, W. Murdoch, J. Connell, W. O. Douglas, J. W. Gofman, A. R. Tamplin, K.E.F. Watt, E. Contini, W. M. Kitzmiller, N. H. Jacoby, and A. King.

1175. Welman, A., "The Environment — Past, Present, and Pluperfect", *Congressional Record*, v. 117, no. 85, 7 June 1971, pp. E5510-5513.

Discusses environmental pollution since prehistoric days and recounts conclusions from the 1970 Study of Critical Environmental Problems which dispel the "myths" that CO<sub>2</sub> will build up to dangerous levels, that our atmospheric oxygen is being exhausted, that waste heat will ruin the ecology, that our rivers and lakes are irreparably damaged, and that urban atmospheres are being universally degraded; discusses the ideal roles of science and technology, politics, law, and economics in producing a perfect environment.

1176. Scherer, J., "Pollution and Environmental Control", *Federal Reserve Bank of New York Monthly Review*, v. 53, no. 6, June 1971, pp. 132-139.

Discusses the growing pollution problem; mechanisms for coping with it (effluence charges waste-disposal standards, subsidies, recycling, conservation); costs of control (of air, water, solid-waste, and radiation pollution); and impact on economic indicators (e.g., GNP).

1177. Murphy, E. F., *Man and His Environment: Law*, Harper & Row, New York-London, 1971, 168 pp. (\$3.25, paperback)

Expounds on the worsening crisis in man's environment and the legal aspects of the control problem under the chapter titles The Environment as Problems, Law and Environmental Use, Changing Man's Traditions About Nature, How Free is Nature to Man?, The Legal Ways of Controlling Nature, The Value to Man of His Environment, and The Time Limits for Man's Future; indexed in depth.

1178. Grad, F. P., Rathjens, G. W., and Rosenthal, A. J., *Environmental*



**Control: Priorities, Policies, and the Law**, Columbia University Press, New York and London, 1971, 311 pp. (\$9.00)

Consists of a treatise by each author; "National Environmental Policy: Goals and Priorities" by Rathjen: classifies environmental insults and discusses standard setting, mechanisms, and Federal programs for environmental control; "Intergovernmental Aspects of Environmental Controls" by Grad covers the role of each governmental level in formulating and enforcing policies and standards, as well as legal and administrative interactions; "Federal Power to Preserve the Environment: Enforcement and Control Techniques" by Rosenthal deals with Federal authority, sanctions, subsidies, incentives, charges, private litigation, and international action.

1179. Stans, M. H., "Wait a Minute", *Congressional Record*, v. 117, no. 122, 31 July 1971, pp. E8575-8577.

Urges development of public and private policies integrating economics, technology, and environmental protection; cites examples where anxieties over environmental pollution overrode other considerations; presents guidelines for dealing with environmental pollution, weighing all factors and consequences.

1180. Jackson, H. M., "Balancing Resource Use and Environmental Quality", Address presented to the 12th Annual Fontana Conservation Roundup, *Congressional Record*, v. 117, no. 87, 9 June 1971, pp. S8626-8628.

Sen. Jackson discusses the adverse effects that would result if science and technology were halted in the name of environmental protection; blames the no-growth attitudes on lack of policy analysis in dealing with environmental problems; describes his proposed National Environmental Policy Institute and National Land Use Policy Act.

1181. Solow, R. M., "The Economist's Approach to Pollution and Its Control", *Science*, v. 173, no. 3996, 6 August 1971, pp. 498-503.

Describes the faults of piecemeal regulation of pollution and supports effluent taxes and charges over direct regulation; describes a scheme proposed by E. S. Mills that would have the Government collect a materials-use fee on specified materials removed from the environment.

1182. "The Mounting Bill for Pollution Control", *Fortune*, v. 84, no. 1, July 1971, pp. 86-89, 130-132.

Discusses the cost of pollution control to industry and the consumer, giving numerous examples in the chemical, steel, petroleum, and power industries; points out the need for clear standards and "basic cost-benefit studies of environmental technology".

1183. Rockefeller, D., "Environmental Improvement: The Economic Aspects", *Congressional Record*, v. 117, no. 101, 30 June 1971, pp. E6808-6809.

Discusses the effects of pollution-control measures on the economy, foreign trade, employment, production, and the individual; expresses confidence that the public will make the

sacrifices necessary to halt the destruction of the environment.

1184. Soderlind, S. E., "The High Cost of Unpolluted Living", *Congressional Record*, v. 117, no. 98, 24 June 1971, pp. S9924-9925. (Reprinted from the *National Observer*, June 21.)  
Discusses the high costs of developing and incorporating pollution-control devices, and how these costs will affect industry, motorists, and the general public.
1185. Gilmore, J. S., et al., *Environmental Policy Analysis: Public Policy Intervention in Inter-Industry Flows of Goods and Services to Reduce Pollution; Parts I and II: Demonstration, Summary and Methodology*, August 1971, 150 pp. (Available from Denver Research Institute, University of Denver, Denver, Col. 80210.)  
Describes a methodology for the systematic analysis of pollution problems and public policy responses to those problems, to assist decision makers in evaluating alternative policies and standards; demonstrates with a scenario illustrating the problems faced by state and local governments attempting to implement Federal air quality standards.
1186. *Pollution in Alabama*, Prepared by the Department of Civil Engineering, Auburn University, for the Alabama Environmental Conference, Auburn, Alabama, 30 September – 1 October 1970.  
Discusses results of a survey on pollution and abatement measures taken in Alabama's larger cities and industries; existing data were collated with information gained from the survey to obtain an accurate picture of water, air, and land pollution and the abatement procedures being taken to remedy the problems.
1187. *Environmental Quality in Oregon 1971, A Summary of Current and Future Problems, Report from the Advisory Committee on Environmental Science and Technology*, 58 pp. (Available from the Advisory Committee on Environmental Science and Technology, Environmental Science Information Coordinator, Oregon State University, Room 237 Weniger Hall, Corvallis, Oregon.)  
Establishes the basis for public concern in Oregon about environmental quality; identifies, classifies, and assesses the severity of pollution problems in regard to air and water quality, solid and chemical waste management; presents a few recommendations for future action by the universities and state government.
1188. Abelson, P., "A Geophysicist's Watch on the Environment", *New Scientist and Science Journal*, v. 50, no. 756, 17 June 1971, pp. 696-698.  
Explains how geophysicists, through their understanding of natural and man-made influences on the environment, can recognize and analyze the real problems in the environmental crisis and thereby dispel misconceptions and lead the way to effective environmental control; presents a number of illustrative examples.

## POLLUTION – RADIATION

1189. Gravel, M., "Radioactive Contamination from Nuclear Power Plants",

*Congressional Record*, v. 117, no. 88, 10 June 1971, pp. S8851-8852.

Sen. Gravel discusses why the Atomic Energy Commission's proposal to lower permissible radiation doses from nuclear powerplants is only one among many steps needed to reduce the risk of radioactive contamination of this planet; urges that the AEC strongly protest radioactive waste dumping into the North Atlantic by the European Atomic Energy Agency (ENEA).

1190. Barnaby, F., "Breeder Power Dangers", *New Scientist and Science Journal*, v. 50, no. 757, 24 June 1971, p. 727.

Defence Technology Editor Barnaby describes efforts by the Scientists' Institute for Public Information (SIPI) to compel, by legal action, the U.S. Atomic Energy Commission to "disclose the total environmental effect of its breeder reactors before proceeding further with their development"; points out that the possibility of plutonium fuel being illegally diverted to weapons use is a greater threat than the danger of radioactive contamination of the environment.

1191. Brown, R., "Nuclear Garbage Dump — The AEC has Something for Kansas", *Congressional Record*, v. 117, no. 88, 10 June 1971, pp. H5043-5045. (Reprinted from *Nation*, 7 June 1971.)

Discusses the Atomic Energy Commission's plan to form a nuclear repository near Lyons, Kansas, the dubiously effective safety precautions, and efforts of some private citizens to assure that the project will be safe and of others who are attempting to halt the project.

1192. Larson, C. E., "Not In Retrospect", Remarks at the Third National Symposium on Radioecology, Oak Ridge, Tenn., 10 May 1971, *AEC News Releases*, v. 2, no. 25, 23 June 1971, pp. 9-12.

Atomic Energy Commissioner Larson discusses the importance of the field of radioecology and the AEC's present goals and involvements in this field; predicts increasing ecological experimentation or environmental manipulation and more systems analysis studies in the future, supported mainly by the USAEC.

## POLLUTION — SOLID WASTES

193. Marx, W., *Man and His Environment: Waste*, Harper & Row, New York-London, 1971, 179 pp. (\$3.25, paperback)

Discusses man-made waste problems under such chapter headings as Man as Waste-Maker, The Planet as Dump, The Dump Spills Over; covers cleanup attempts and recommendations under Trying to Right the Dump, Pollution: Adaption or Control?, Plagiarizing Nature, Designed for Coexistence, Power with Control, and The Snow is White Again; indexed in depth.

194. "Solid Waste Management", *Professional Engineer*, v. 41, no. 7, July 1971, pp. 35-42.

Consists of six articles, each by a different author, dealing respectively with improved, more practical forms of waste management; reclamation and recycling of glass and paper; better methods of solid waste collection; automatic sorting of solid

waste for easier recycling; the economic recycling of metals and minerals from urban refuse; and the conversion of solid wastes to pipeline gas.

1195. *Solid Waste Management: A List of Available Literature*. Report SW-58.11, July 1971, 17 pp. (Single copies available from Solid Waste Management Publications Distribution, U.S. Environmental Protection Agency, 5555 Ridge Ave., Cincinnati, Ohio 45213.)

Contains 190 unannotated references to literature collected or published by the EPA in response to a directive emphasizing the importance of making available information on solid-waste-related research, demonstration projects, and other activities.

1196. Toftner, R. O., and Clark, R. M., *Intergovernmental Approaches to Solid Waste Management*, U.S. Environmental Protection Agency, Solid Waste Management Office, 1971, 18 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 30 cents.)

Examines the "organizational requirements of solid waste management systems" and discusses intergovernmental mechanisms for meeting these requirements on a regional basis, in view of the fact that solid-waste problems transcend governmental boundaries.

1197. *Resource Recovery Emphasized in Organizational Name Change*, News Release, 7 September 1971, 3 pp. (Available from National Center for Resource Recovery, Inc., 1211 Connecticut Ave., N.W., Washington, D.C. 20036.)

Announces that the National Center for Solid Waste Disposal, Inc., has been renamed the National Center for Resource Recovery, Inc., to reflect the Center's "broadened approach to the nation's solid waste problems", viz., recovery of valuable resources from municipal mixed refuse rather than disposal.

1198. Kenahan, C. B., "Solid Waste: Resources Out of Place", *Environmental Science & Technology*, v. 5, no. 7, July 1971, pp. 594-660.

Describes sources of solid wastes (urban refuse, mineral waste from mining and processing, and agricultural waste) and gives numerous examples of activities of the Department of Interior's Bureau of Mines under the 1910 Organic Act, the 1965 Solid Waste Disposal Act, and the 1970 Resource Recovery Act toward reclaiming values from such wastes; 7 references.

1199. Mahsman, D., "Urban Ore: An Untapped Natural Resource", *Congressional Record*, v. 117, no. 113, 21 July 1971, pp. S11699-11700. (Reprinted from *Washington Post*, 20 July 1971.)

Describes the operations of the U.S. Bureau of Mines Research Center's pilot plant in Edmonston, which has been recycling incinerator residue from surrounding cities; the project demonstrates that reclamation is both feasible and commercially attractive to areas with a population of at least 500,000; comments on future raw-refuse recycling plants and potential uses of reclaimed products.

1200. Buckley, J. L., "Trash is Cash", *Congressional Record*, v. 117, no. 108, 14 July 1971, pp. S10870-10871.



Sen. Buckley describes the "Trash is Cash" program of the Environmental Action Coalition of New York City, designed to teach the public that household refuse is environmentally damaging and that it can be recycled; presents an article which describes the types of containers most profitable to recycle.

1201. Bow, F. T., "Methods of Recycling Pollutants", *Congressional Record*, v. 117, no. 86, 8 June 1971, pp. E5591-5592.

Rep. Bow presents a letter from Mr. C. C. King emphasizing the need for development of techniques to recycle wastes to reduce pollution and conserve national resources; presents a resolution calling for research on recycling technologies to be emphasized and supported on the same scale as support for agriculture, medicine, outer space, and warfare.

1202. Williams, L. E., "Expanding the International Wastepaper Market", *Congressional Record*, v. 117, no. 107, 13 July 1971, pp. E7567-7568.

Mr. Williams, vice-president of the Container Corp. of America, describes the large international market for recycled wastepaper available to the U.S. if the delivered price can be lowered; suggests continued development of faster shipping, techniques for increasing the density of paper bales, and techniques for better and cheaper collection and processing of wastepaper.

1203. Carlson, C. W., and Menzies, J. D., "Utilization of Urban Wastes in Crop Production", *BioScience*, v. 21, no. 12, 15 June 1971, pp. 561-564.

Examines the problems of converting urban wastes into land additives for chemical and microbiological conversion into plant nutrients or innocuous substances; deals specifically with the disposal of municipal refuse, sewage sludge, liquid sewage effluent, and food-processing wastes.

1204. "Bury or Burn: Plastics' Dilemma", *Industrial Research*, v. 13, no. 7, July 1971, p. 25.

Discusses the feasibility and relative advantages and disadvantages of disposing of plastic wastes by burning, burying, or recycling, as brought out at the 28th annual western conference of the Society of the Plastics Industry.

## POLLUTION - WATER

1205. Hamilton, L. H., "Federal Role in Pollution Control", *Congressional Record*, v. 117, no. 113, 21 July 1971, pp. E8052-8053.

Rep. Hamilton examines the sacrifices necessary to solve environmental problems; describes the Federal programs arising from the Federal Water Pollution Control Act of 1956 and the Water Quality Act (1965); cites deficiencies in current Federal laws pertaining to water pollution; gives 3 policy alternatives for dealing with water pollution and presents suggestions for government actions.

1206. "Water Pollution: Cleanup Gets Moving", *Chemical & Engineering News*, v. 49, no. 39, 20 September 1971, pp. 16-24.

Discusses actions being taken on 3 fronts to deal with water pollution: (1) legislative moves by Congress, (2) water-quality monitoring steps by the states and industry, and (3) activities of major chemical companies toward complying with terms of the water discharge permit program.

1207. "Toxic Substances Control Act of 1971 — Amendment", *Congressional Record*, v. 117, no. 127, 6 August 1971, pp. S13511-13514.

Sen. Hart introduces an amendment to the Toxic Substances Act of 1971, to provide the research and resources necessary to deal with water-pollution problems affecting the community, e.g., drinking-water contamination; presents remarks by Sen. Magnuson emphasizing the need for action; summarizes a report which examines the problems and recommends that research and facilities for dealing with water contamination be upgraded.

1208. "Whitewash for Phosphates", *Congressional Record*, v. 117, no. 139, 23 September 1971, p. E9943. (Reprinted from the September 22 *New York Times*.)

Comments on the lack of justification for Federal officials' urging a return to phosphate detergents, suggesting instead "a holding pattern" wherein housewives use caustic soda and soap until "really harmless detergents, several of which are well on the way", are developed.

1209. Cywin, A., "Engineering Water Resources for 2070", *Mechanical Engineering*, v. 93, no. 7, July 1971, pp. 7-10.

Discusses how water resources must be dealt with now if we are to meet the needs of the estimated U.S. population of one billion in 2070; calls for the recycling of fresh water and the monitoring of resource shortages; discusses some technical solutions, including water prospecting, diversion, reclamation, and desalination.

## POPULATION

1210. "Population Resolution Hearing", *Congressional Record*, v. 117, no. 127, 6 August 1971, pp. S13456-13463.

Presents testimony given at the first hearing of the Subcommittee on Human Resources of the Senate Labor and Public Welfare Committee concerning Senate Joint Resolution 108, which calls for a U.S. policy of achieving population stabilization by voluntary means; the statements cover the urgency of the resolution and the effects of population growth on society and economics in the U.S.

1211. Gamon, D. L., "Population Growth and National Development", *U.S. Department of State Bulletin*, v. 65, no. 1677, 16 August 1971, pp. 172-178.

Discusses the effect of increased population growth (due to the decreased death rate rather than an increased birth rate) on the economic and social development of the U.S.; relates fertility to income level and state of the economy, and interprets observations in terms of population trends in foreign countries with

various degrees of economic development (Japan, West Germany, Mexico, and Latin America).

1212. Schatz, G. S., "Effects of Rapid Population Growth: Profound Challenges to Mankind", *News Report*, NAS/NRC/NAE, v. 21, no. 6, June-July 1971, pp. 1, 4-5.

Reviews the results of studies made since 1963 by four different committees of the National Academy of Sciences, with emphasis on the latest (Ref. 1213), on the impact of population growth rate; discusses whether the limiting of family size should be determined by the family or by national policy.

1213. "Slowing Population Growth: Recommendations from a Special Study", *News Report*, NAS/NRC/NAE, v. 21, no. 6, June-July 1971, pp. 6-7.

Presents excerpts from a report by a special committee of the Office of the Foreign Secretary of the National Academy of Sciences, recommending that the option of limiting family size should be left up to the family but that national policies which are "politically and ethically acceptable" should be adopted by all nations to limit their population growth rates; report makes specific suggestions for national-government population-control activities that are responsive to demographic trends in each country, including increased research and education in the areas of fertility behavior and the economic and social effects of population growth. The report, *Rapid Population Growth: Consequences and Policy Implications*, John's Hopkins Press, 1971, is available at \$20 hardbound in one 696-page volume (ISBN O-8018-1263-1), or at \$2.45 for the 105-page paperbound Vol. I (ISBN O-8018-1264-X).

1214. Horton, F., "National Population Stabilization", *Congressional Record*, v. 117, no. 124, 3 August 1971, p. H7778.

Rep. Horton urges the development of a long-range U.S. policy of population stabilization; reviews findings presented in the interim report of the Commission on Population Growth and the American Future concerning projected population figures and U.S. resources for dealing with the population problem.

1215. Trotter, R. J., "Predicting and Preventing Population Problems", *Science News*, v. 100, no. 7, 14 August 1971, pp. 114-115.

Presents 3 possibilities for population-growth trends in the 21st century: (1) a calamitous population crash during the 21st century; (2) occurrence of a number of disasters related to overpopulation, forcing the population itself to act to restrict its growth; or (3) a gradual transition to zero population growth which can be achieved by using psychological, logical, social, or economic incentives to limit fertility.

1216. Claxton, P. P., Jr., "The Development of Institutions to Meet the World Population Crisis", *U.S. Department of State Bulletin*, v. 65, no. 1677, 16 August 1971, pp. 165-171.

Describes the U.S. Government's policies on population control; discusses the growth of institutions on the international, national, regional, and local levels designed "to help modernize birth rates



as death rates have been and are being modernized".

1217. Brown, H., "After the Population Explosion", *Congressional Record*, v. 117, no. 101, 30 June 1971, pp. S10378-10380.

Delves into factors affecting population growth, and examines the problems that will result from overpopulation, e.g., food shortages, energy shortages, and dissipation of the heat from nuclear power plants; discusses social, political, and economic aspects of population growth.

1218. Barnett, L. D., "Zero Population Growth, Inc.", *BioScience*, v. 21, no. 14, 15 July 1971, pp. 759-765.

Describes a study of a 155-member sample of the 17,500 members of the population control organization, Zero Population Growth, Inc. (ZPG); classifies respondents by race, sex, marital status, student or not, political philosophy, religion, age, educational attainment, family size intentions, opinion on ideal population-control policies; includes a discussion and bibliography.

1219. Meadows, D. L., "The Predicament of Mankind", *The Futurist*, v. 5, no. 4, August 1971, pp. 137-144.

Describes the global-interaction simulation being attempted by MIT's System Dynamics Laboratory under sponsorship of the Club of Rome; the current project, World 3, represents population-growth forces as a function of the biological, political, economic, physical, and social factors which influence them; offers six preliminary conclusions.

## PORTUGAL

1220. Eargle, D. H., Jr., "Chemical Education in Portugal at New Stage", *Chemical & Engineering News*, v. 49, no. 26, 28 June 1971, pp. 26-31.

Describes Portugal's "developing" higher education system, particularly in the field of chemical education and research; describes the total university picture as seen by a U.S.-born and -educated chemistry professor at Portugal's University of Coimbra.

## PRIORITIES FOR R&D

1221. McIntyre, T. J., "The Importance of Research and Development", *Congressional Record*, v. 117, no. 128, 8 September 1971, pp. S13880-13882.

Presents 2 articles by Victor Cohn, reprinted from the September 5 *Washington Post*, dealing with the importance of R&D; the first describes the lead taken by MIT in transferring R&D emphasis from military to social, industrial, and environmental uses; the second describes the Nixon Administration's battle over whether to increase Federal spending for both research and industrial development, and the effect of limited U.S. support of industrial R&D on the U.S. trade balance.



1222. "Statement of Chairman John W. Davis Regarding Hearing on Science, Technology and the Economy", *Congressional Record*, v. 117, no. 113, 21 July 1971, p. E8107.

Announces hearings on July 27-29 seeking to ascertain what total resources the U.S. should invest in R&D in both public and private sectors and how these investments should be made for optimum effectiveness.

1223. "What Next for Programs Dropped by AEC", *Physics Today*, v. 24, no. 7, July 1971, pp. 57, 59-60.

Discusses the poor prospects for NSF to support all of the \$7.5 million worth of physical research to be dropped by the AEC; describes some of the existing AEC projects scheduled for termination and lists 23 universities that are losing their contracts in low- and medium-energy physics.

#### **SAFETY**

1224. Pettis, J. L., "System Safety — Planet Earth", Keynote address at NASA System Safety Conference, Greenbelt, Md., 26 May 1971, *Congressional Record*, v. 117, no. 85, 7 June 1971, pp. E5523-5525.

Discusses the system safety concept in its broad context, presenting the analogy of its application to space flight and the Apollo 13 rescue to its application toward "safely piloting the passengers and crew of Spaceship Earth into a more creative, harmonious, and prosperous future".

1225. *Special Study of Rail Rapid Transit Safety*, National Transportation Safety Board, Washington, D.C. 20591, Report NTSB-RSS-71-1, 16 June 1971, 28 pp. (Available from National Technical Information Service, Springfield, Va. 22151. Price: \$3.00, paper, or 95 cents, microfiche.)

Identifies areas of risk and recommends means for improving safety in new and existing rail rapid-transit systems, based on experiences in Chicago, New York, and Philadelphia; subjects include accident reporting, accident experience, emergency preparedness, transit-car design, signal systems, maintenance procedures, safety efforts, research, and data exchange; recommends that applicants for funding under the Urban Mass Transportation Assistance Act be required to submit system safety plans.

1226. Moss, F. E., "Air Collision Avoidance Systems", *Congressional Record*, v. 117, no. 106, 12 July 1971, p. S10711.

Sen. Moss introduces a bill, S. 2264, to amend Section 601 of the Federal Aviation Act of 1958 by requiring the installation of collision-avoidance and pilot warning-indicator systems on certain aircraft by 1 January 1973 to minimize the danger of mid-air collisions.

1227. "Safety Vehicle Data", *Washington Science Trends*, v. 26, no. 26, 4 October 1971, p. 157.

Announces the availability for inspection and copying of an information file related to the Experimental Safety Vehicle Pro-

gram, including contracts awarded, memoranda of understanding with 4 countries, supporting R&D reports, and technical information from participating governments and manufacturers; available at National Highway Traffic Safety Administration, Room 5119, 400 Seventh St. S.W., Washington, D.C.

## SCIENCE POLICY STUDY ORGANIZATIONS

1228. LaPorte, T., "Science, Technology, and Public Affairs at the University of California, Berkeley, *SPPSG Newsletter*, v. 2, no. 6, June-July 1971, pp. 10-12.

Describes relevant activities at Berkeley, including establishment of an Advisory Committee on Science, Technology, and Public Affairs programs, offering of regularly scheduled courses (with new ones added continually), informal faculty and graduate seminars, and the initiation of a number of research projects (e.g., in environmental research, transportation engineering, urban and regional development, international studies, and governmental studies); for information, write Professor LaPorte, Institute of Government Studies, University of California, Berkeley, 94720.

1229. "Program Given Notice", *Science*, v. 173, no. 3993, 16 July 1971, p. 219.

Announces the phasing out of Harvard's pioneering program on technology and society, with the remainder of the program's IBM support grant to be used to create new teaching posts; cites areas in which the Harvard program misfired.

## SOCIETY-SCIENCE INTERACTION

1230. Handler, P. H., *Can Man Shape His Future?*, The 1970 W. O. Atwater Memorial Lecture, Agricultural Research Service, 36 pp. (Available from the Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C. 20250.)

Discusses science as an instrument of man to achieve a better world; describes the role of science in controlling overpopulation, food shortages, and environmental quality, and in promoting the utilization of the earth's resources.

1231. Burhoe, R. W. (Ed.), *Science and Human Values in the 21st Century*, The Westminster Press, Philadelphia, 1971, 203 pp. (\$6.95, cloth-bound, or \$3.45, paperback)

Presents essays by 5 different authors answering the question What about human values in the 21st century? — posed by Pittsburgh Theological Seminary's 175th Anniversary Committee and discussed at a 3-day conference last March; deals primarily with religion-science interactions and their implications for the future.

1232. Allan, J. D., and Hanson, A. J., "Citizen & Scientist", *Ecology Today*, v. 1, no. 7, September 1971, pp. 2-3, 52-53.

Discusses ways in which the scientist can make serious contribu-

tions to society and environmental protection; lists 7 "straight-forward" recommendations for scientific involvement in society.

1233. Foreign Policy Association (Ed.), *Toward the Year 2018*, Published by Cowles Education Corporation, Look Building, 488 Madison Avenue, New York, N.Y. 10022, 1968, 177 pp. (\$5.95).

Presents speculative statements from business, academic, and professional experts on the probable courses of today's problems, systems, and programs over the next 50 years in such areas as weaponry, energy, food, population, transportation, communication, education, computers, and oceanography.

1234. *Science, Growth, and Society: A New Perspective*, Report on the Secretary-General's Ad Hoc Group on New Concepts of Science Policy, Organisation for Economic Co-operation and Development, 1971, 113 pp. (Available from Publications Office, OECD, 1750 Pennsylvania Ave., N.W., Washington, D.C. 20006. Price: \$2.25.)

Presents the Ad Hoc Group's assumptions concerning existing science policy issues (Part I); a discussion of relations among economic growth, technology, and society (Part II); an evaluation of science policy in the 1960's (Part III); suggested new approaches to science policy in the 1970's (Part IV); and recommendations to the OECD membership (Part V) — including support of basic research, international collaboration, improved technology assessment, machinery for science policy formulation, and technical assistance to developing nations.

1235. Salomon, J.-J., "A Science Policy for the 1970's", *OECD Observer*, no. 53, August 1971, pp. 3-9.

Summarizes some of the themes in the report of the Organisation for Economic Cooperation and Development's Ad Hoc Group on New Concepts of Science Policy (Ref. 1234), under the chairmanship of Harvard's Dean Harvey Brooks; emphasizes that science and technology should be more closely linked to social rather than economic needs.

236. Ben-Davis, J., *The Scientist's Role in Society, a Comparative Study*, Foundations of Modern Sociology Series, Prentice-Hall, Englewood Cliffs, N.J., 1971, 207 pp. (\$6.95, clothbound, or \$2.95, paperback)

Discusses conditions preventing science from becoming a socially valued activity until the late 17th century; traces the evolution of the role of the scientist and evolution of the scientific community into large and powerful modern universities and research institutes; analyzes shifts in the world center of scientific activity from its emergence in Italy in the early 1600's to England, then successively to France, Germany, and the U.S.; indexed.

237. "Science and Society", *Nature*, v. 232, no. 5305, 2 July 1971, p. 7.

Reports on a conference in Brussels of about 200 top scientists dealing with the impact of science on society; reviews discussions of the ethics of brain research and moral issues of molecular biology; the conference was disappointing to some who felt that it dealt "too much with generalities and not enough with specific issues".





1238. "Scientists, Policy Makers Seek Common Cause", *Chemical & Engineering News*, v. 49, no. 40, 27 September 1971, pp. 29-31.  
Presents thumbnail sketches of material presented at a week-long series of symposia at the American Chemical Society national meeting in Washington, focusing on interrelationships among scientists, science policy, politics, and the environment.
1239. Dubos, R., "The Predicament of Man", Seventh Annual Science Policy Foundation Lecture delivered at the Royal Society, London, 5 April, *Science Policy News*, v. 2, no. 6, May 1971, pp. 64-69.  
Examines the reasons for the environmental "predicament of man"; suggests general methods for dealing with this predicament, such as emphasis on quality rather than quantity and greater application of specialized technologies to the needs of society.
1240. Liverman, J. L., "Making Science Serve Man", Paper submitted to the Fourth International Conference on Science and Society at Herceg-Novi, Yugoslavia, *Congressional Record*, v. 117, no. 110, 16 July 1971, pp. E7839-7840.  
The Associate Director of Biomedical and Environmental Sciences of the Oak Ridge National Laboratory (ORNL) discusses (1) the need to "institutionalize" the problems of environmental quality, (2) programs of ORNL to achieve atomic energy safety and environmental quality, and (3) new attempts to make science serve man.
1241. Holden, C., "Public Interest: New Group Seeks Redefinition of Scientists' Role", *Science*, v. 173, no. 3992, 9 July 1971, pp. 131-132.  
Describes the purpose of the recently established Center for Science in the Public Interest (CSPI): "to explore the frontiers of social responsibility in science"; CSPI plans to (1) provide competent witnesses to testify at Congressional hearings on science-related legislation; (2) conduct studies to supply consumers with information presently unavailable or obscured; (3) instigate lawsuits and act as "complaintiff in public-interest legal actions".
1242. Baram, M. S., "Social Control of Science and Technology", *Science*, v. 172, no. 3983, 7 May 1971, pp. 535-539.  
Tabulates sources of control (scientific peer groups, professional associations, Federal government, industry-consumer markets, industrial associations and unions, insurance, crusaders and citizens' groups, law, and education-ethics; discusses the effectiveness of each source in preventing or countering any adverse influences of science and technology, dwelling particularly on the law and education, and makes some positive recommendations.
1243. Ziman, J., "Social Responsibility (I): The Impact of Social Responsibility on Science", *Impact of Science on Society*, v. 21, no. 2, April-June 1971, pp. 113-122.  
Discusses the utter inability of scientific and technical specialists to deal with the political and moral issues related to science; contends that scientists themselves must oppose the irresponsible

use of science, but must be protected from "the pressures of an ignorant public, a shameless press, rapacious money-makers and opportunist politicians".

1244. Leitenberg, M., "Social Responsibility (II): The Classical Scientific Ethic and Strategic-Weapons Development", *Impact of Science on Society*, v. 21, no. 2, April-June 1971, pp. 123-136.

Points out the increasing obsolescence of the classical ethic calling for all scientists to apply strict standards of truth and accuracy in their work, and discusses the rationale that leads them to engage in weapons development; recommends that the scientific community stop making "symbolic gestures and inadequate efforts" and utilize its political leverage to control the directions of its work.

1245. Rose, S., and Rose, H., "Social Responsibility (III): The Myth of the Neutrality of Science", *Impact of Science on Society*, v. 21, no. 2, April-June 1971, pp. 137-

Presents a 4-part program of action for scientists to build human relevance into the performance of their work; contends that many of the world's problems are caused by the belief that science can be neutral — an impossibility, even for pure research.

1246. "West Germany: Federal President Speaks on Scientists Responsibility", *Science Policy News*, v. 3, no. 1, July 1971, p. 8.

President Heinemann describes the role today's scientist must play in social decision making: accept political responsibilities, recognize the social implications of his research results, and participate in decisions not only on application of results but also on research objectives.

1247. "The Greening of Technology", *Scientific American*, v. 225, no. 2, August 1971, pp. 44-45.

Discusses a report reassessing European science policy, prepared for the Organization for Economic Cooperation and Development (OECD); report stresses that the policy must become more concerned with society and the environment and less with the private consumer and the rapidly growing economy, if a reaction against science, with a resultant retardation of scientific progress, is to be avoided.

248. Callahan, D., "Profile: Institute of Society, Ethics and the Life Sciences", *BioScience*, v. 21, no. 13, 1 July 1971, pp. 735-737.

Describes the formation and programs (research, teaching and information) of the Institute of Society, Ethics and the Life Sciences which was founded to evaluate the "moral, ethical, and legal questions" arising from "the growing possibilities of euthanasia, genetic engineering, behavior control, population control, and improved disease control".

249. Hilton, B. (Ed.), *The Hastings Center Report*, no. 1, June 1971, 12 pp. (To be published 8 times a year; inquiries should be sent to Bruce Hilton, Hastings Center, 623 Warburton Avenue, Hastings-on-Hudson, New York, N.Y. 10706.)

Presents a set of articles under the auspices of the Institute of Society, Ethics and the Life Sciences (see Ref. 1248) covering

such topics as decision-making, moral and ethical problems created by advancing biomedical technology, and psychology of death, and U.S. population policy — all examining questions of ethics, morality, and legality; includes brief reviews of 25 relevant literature references.

1250. *Public Science Policy: Background Reading, Western States Conference on Science and Technology and Its Application to the Problems of Pollution, Transportation and Employment*, Salt Lake City, Utah, 9-11 March 1970, Prepared by the Federation of Rocky Mountain States, Inc., and the Western Governors Conference, Suite 203/1390 Logan, Denver, Col., 134 pp.

Presents 10 papers which discuss the possibilities of resolving the pollution, transportation, and employment problems facing the Western U.S.; the goal of the conference was to provide good reference material and guidance in planning for the application of science and technology to these problems before they become as critical as in the Eastern U.S.

1251. "Environment in Crisis: The Engineer's Stake in Survival", *Consulting Engineer*, v. 36, no. 3, March 1971, pp. 76-184.

The 17 articles in this issue deal with assorted aspects of man's environment; national priorities are discussed by R. Train and by Sen. G. Nelson; the impacts of rapid growth and technological excesses on the ecology are covered by R. Dubos and by I. McHarg; futures are dealt with by C. A. Doxiades (shifting human settlements), H. Daly (controlling population growth and resources), and W. Olson (utilizing space technology); others cover air and water pollution, solid waste management, transportation, power, and housing.

1252. Couderc, P., "An Antidote for Anti-Science", *Impact of Science on Society*, v. 21, no. 2, April-June 1971, pp. 173-179.

Presents a strong plea and recommends procedures for scientists to combat anti-science by a sound and widespread popularization of science to make the public aware of its concepts, objectives, capabilities, and promise — understandings which will equip individuals to participate responsibly in today's scientific-technical world of change.

1253. Anderson, C. A., "U.S. Technology is Threatened — Curbing R&D Cripples Progress", *Congressional Record*, v. 117, no. 129, 9 September 1971, pp. E9393-9394. (Reprinted from *New York Times*, 22 August 1971.)

Describes the unfavorable attitudes in the U.S. toward science and technology and the resulting decreased support for R&D; emphasizes that increased R&D is necessary to assure needed advances in such areas as pollution control, population control, transportation, and energy generation.

1254. Thackary, A., "Reflections on the Decline of Science in America and on Some of Its Causes", *Science*, v. 173, no. 3991, 2 July 1971, pp. 27-31.

Discusses the controversies that have arisen between science and society in the light of past failures of scientists to adapt to

changing social needs; warns that only "continuing responsive evolution of scientific societies in America" can forestall the decline of science.

1255. Ravetz, J., "Ideological Crisis in Science", *New Scientist and Science Journal*, v. 51, no. 758, 1 July 1971, pp. 35-36.

Discusses the transformation of ideology that science must witness if it is to progress and attain the position of high public opinion it held a few years ago; suggests that "the best candidate for such a rejuvenating influence is the 'critical science' devoted to protecting man and the environment from the effects of ignorant or greedy technology".

1256. Maddox, J., "The Doomsday Syndrome", *Nature*, v. 233, no. 5314, 3 September 1971, pp. 15-16.

Describes the inaccurate views held by commentators on the relationship of science and technology with society, specifically in those areas of technology believed to be responsible for the population explosion and pollution from insecticides, and presents a more rational picture.

1257. "Address by Dr. Wernher von Braun at the National Aviation Club, Washington, D.C., May 27, 1971", *Congressional Record*, v. 117, no. 98, 24 June 1971, pp. S9906-9907.

Presents numerous examples of the growing anti-science and -technology sentiments and points out some of their fallacies and dangers.

1258. Cade, J. A., "Aspects of Secrecy in Science", *Impact of Science on Society*, v. 21, no. 2, April-June 1971, pp. 181-190.

Discusses the conflicts created by the problem of secrecy about scientific information and, assuming that secrecy is ever justified, what can be done to make it more acceptable to scientists on intellectual grounds rather than on moral or political ones.

1259. *Implications of Computer Technology*, Research Review No. 7, Harvard University Program on Technology and Society, 1971, 56 pp. (Available from the Harvard University Press, 79 Barden Street, Cambridge, Mass. 02138. Price: \$2.00.)

Presents a documented summary and abstracts of recent literature on computer science, covering the economic (12 references), political (19 references), and cultural (10 references) implications of modern computer technology on society.

1260. Henderson, H., "Computers at the Crossroads", *The Futurist*, v. 5, no. 4, August 1971, pp. 151-154.

Discusses the need for public debate to effect realization that computers are indispensable in managing the complex interacting social systems and physical resources of our planet"; notes MIT's attempts to simulate these systems under sponsorship of the Club of Rome.

1261. Mascall, E., "A Theologian's View of Science", *New Scientist and Science Journal*, v. 51, no. 765, 19 August 1971, pp. 417-419.

Questions the effects of advancing science, particularly genetic engineering, on the inherent value of man and why scientists



wish to change man; believes "the human race is faced with a more serious threat in this field than is offered by the more visible menaces of nuclear war, overpopulation and environmental pollution".

1262. Doblin, J., "Toward a Science of Design", *Professional Engineer*, v. 41, no. 7, July 1971, pp. 28-32.

Discusses the application of systems design to the solution of today's problems, and points out that methods and models have not been developed for dealing with complex multisystem problems like war, economics, politics, race relations, business, crime, transportation, environment, education, housing, and medicine; concludes that "the prime task of mankind and design" is to "find out how to model and control these human conditions".

1263. Grobman, A. B. (Ed.), *Social Implications of Biological Education*, Darwin Press, Inc., Princeton, N.Y., 1971, 134 pp. (\$5.50).

Consists of presentations from a 1969 Biology Teachers' Convention, each followed by pertinent discussions by leading authorities and a question-and-answer section; attempts to introduce biology and science teachers to some significant interactions of science and society, utilizing examples from each of 5 broad areas: medicine, behavior, genetics, population, and evolution.

## SPACE — COMMUNICATIONS SATELLITES

1264. "Special Report on Satellite Communications", *Aviation Week & Space Technology*, v. 95, no. 8, 23 August 1971, pp. 28-95.

Consists of the following 19 articles, each presenting the status and plans for some aspect of communications satellite activity: Satellite Communications Offer New Potentiality; Growing, Reorganized Intelsat Ponders New Satellite Series; Aerosat Progresses, but Obstacles Remain; Justice Dept. Slows AT&T Case; First Domestic System Planned for Canada; Final Approval of ESRO System Nears; Soviets Expanding Satcom Capabilities; Global Military System Approval Expected; NATO Seeks Phase 3 Satellite Proposals; British Shift to Communications Satellites; NASA Ponders Relay Satellites; TV Education Role Gains World Interest; Symphonie Prototype Development Nears; New Technology for Civil Uses Evolving; Multiple Access Techniques Add Flexibility; Changes in Design, Higher Costs Expected with New Allocations; Propagation Studies in SHF Band Planned for Italy's Sirio Payload; USAF Plans November Launch of Phase-2 Defense Satellites; and New Defense Ground Stations Stress Operational Continuity.

1265. "From Intelsat to Aerosat", *Nature*, v. 232, no. 5313, 27 August 1971, pp. 591-592.

Describes the newly ratified intergovernmental agreement creating a new international communications satellite organization, Intelsat, to replace the temporary Intelsat consortium set up in 1964; describes the international council, Aerosat, which will

decide upon the specifications of the satellite project to be carried out by the American Federal Aviation Association and the European Space Research Organization, and which is in no way connected with Intelsat.

## SPACE — INTERNATIONAL COOPERATION

1266. Croome, A., "Satellites to Police the Atlantic's Busy Air Lanes", *New Scientist and Science Journal*, v. 51, no. 764, 12 August 1971, pp. 362-363.

Examines the new agreement between the U.S. Government, acting through its Federal Aviation Association (FAA), and the European Space Research Organization (ESRO) to develop a satellite system to monitor the air traffic of the Atlantic in order to improve airline safety and efficiency; describes how the system should work and some of the proposed plans.

1267. Anderson, C. P., "Outer Space Liability", *Congressional Record*, v. 117, no. 121, 30 July 1971, pp. S12676-12679.

Announces the agreement by the legal subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space on a draft convention on international liability for damage caused by launching objects into outer space; presents the articles of the convention; presents a statement by H. Reis, U.S. Representative to the U.N. Outer Space Legal Subcommittee, which explains the provisions of the convention.

1268. *Space Cooperation Between the United States and the Soviet Union*, Hearing before the Committee on Aeronautical and Space Sciences, U.S. Senate, 17 March 1971, 30 pp. (Available from Committee on Aeronautical and Space Sciences, U.S. Senate, Washington, D.C. 20510.)

Presents testimony by Dr. G. M. Low, Deputy Administrator of NASA, dealing with the recent increased cooperation between the U.S. and the U.S.S.R. in space — covers agreements between NASA and the Soviet Academy of Sciences to develop compatible docking systems for manned spacecraft, exchange lunar samples, and observe the natural environment, as well as the relative expenditures on R&D by the two countries.

1269. "Summary of Results of Discussions on Space Cooperation Between the Academy of Sciences of the USSR and the U.S. National Aeronautics and Space Administration", *Congressional Record*, v. 117, no. 92, 16 June 1971, pp. S9218-9220.

Spells out the details of agreements to undertake cooperative efforts in the areas of meteorological satellites, meteorological rocket soundings, the natural environment, the exploration of near-earth space, the moon and the planets, and in-space biology and medicine.

1270. "Decisions in Principle", *Nature*, v. 232, no. 5308, 23 July 1971, p. 213.

Describes negotiations of the U.S. and Europe through the European Space Research Organization (ESRO) to transfer air-

traffic-control links to space satellites, and thus accommodate safely a much larger volume of trans-Atlantic air traffic; describes other ESRO activities supported by France, Britain, Germany, and Italy to develop TV, telephone communications, and meteorological satellite systems for Europe.

## SPACE – PROGRAMS AND GOALS

1271. *Astronautics and Aeronautics, 1969, Chronology on Science, Technology, and Policy*, Text by Science and Technology Division, Library of Congress, Sponsored by NASA Historical Division, Office of Policy, National Aeronautics and Space Administration Report NASA SP-4014, 1970, 535 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: \$2.25.)

Presents a chronological record of 1969 events in aerospace science, technology, and policy as reported in the news media, press releases, speech texts, transcripts, testimony before Congress, and test and study reports; a chronicle for 1969 of satellites, space probes, and manned space flights; and a chronology of manned space flights and major NASA launches for 1969.

1272. "FAS Opposes Shuttle", *Nature*, v. 232, no. 5308, 23 July 1971, pp. 217-218.

Discusses the opposition of the Federation of American Scientists to NASA's space-shuttle program on the grounds that it is economically unsound; suggests that NASA's \$137 million FY 1972 budget for the program was passed by Congress to prevent more unemployment in the aerospace industry.

1273. "Space Shuttle: Ready for the Down Payment?", *Astronautics & Aeronautics*, v. 9, no. 8, August 1971, pp. 6-9.

Presents some of the economics involved in determining which type of shuttle the U.S. should develop and quotes figures from the NASA-funded cost study by Mathematica and the Air Force-sponsored study by RAND; cites arguments in favor of proceeding: spinoff from shuttle-technology work, creation of jobs for idle aerospace people, buildup of international prestige, and promotion of international cooperation; suggests that slow economic recovery and the huge near-term NASA budgets needed may prove real deterrents to approval of the shuttle program.

1274. "Benefits From Space Explorations", *Congressional Record*, v. 117, no. 125, Part II, 4 August 1971, p. E8879.

Rep. Coughlin presents reprints of an editorial which discusses the reasons for the Apollo 15 mission and space exploration in general and an article describing the many benefits gained from space exploration (both direct and spinoff).

1275. "CARETS: Remote Sensing for Environmental Studies", *Science News*, v. 99, no. 25, 19 June 1971, pp. 413-414.

Describes NASA's U.S. Earth Resources Survey Program (ERSP) and the Interior Department's Earth Resources Observation System (EROS); these programs will employ high-flying aircraft,

satellites, and spacecraft to monitor ecological changes in a 30,000 square-mile area named the Central Atlantic Regional Ecological Test Site (CARETS), which includes Washington, D.C., and portions of Pennsylvania, New Jersey, Delaware, Maryland, and Virginia.

1276. *Space: Environmental Vantage Point*, U.S. Department of Commerce Publication NOAA/PI 70033 1971, 37 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 70 cents.)

Discusses the application of earth-orbiting satellites for monitoring the earth's environment, and describes current satellites (TIROS and Nimbus, TOS and the ESSA pairs, ATS, and ITOS) and GOES, the Geostationary Operational Environmental Satellite to be launched in 1972.

## STATE SCIENCE ACTIVITIES

277. Maher, T. J., "Public Technology for State Government", *State Government*, v. 44, no. 3, Summer 1971, pp. 142-148.

Describes the approach being taken by the Council of State Governments to focus "the most productive ways to make use of recent advances in science and technology for policy-making and management of states"; delves into current status of state government utilization of new and advanced technology, state problems, policy issues, priority needs, and significant opportunities where advanced technologies could be applied, and methods of technology transfer to state government planning, decision-making, programming, and management.

278. Mock, J. E. (Ed.), *Science for Society*, Proceedings of the National Science Conference on Goals, Policies and Programs of Federal, State and Local Science Agencies, held at Atlanta, Georgia, 12-14 October 1970, 193 pp. (Address inquiries to the Georgia Science and Technology Commission, Box 32745, Atlanta, Ga. 30332.)

Presents the Background Papers [SPB 3(5):1055], speeches, and synopses of the roundtable discussions at the Conference, organized under 6 headings: Intergovernmental Science Policies (6 papers), Symbiosis in Federal-State Science Programs (5 papers and discussion), Critical Problem Areas (5 papers and discussion), State Science Plans and Programs (7 papers and discussion), Regional and Local Science Plans and Programs (7 papers and discussion), and Plans for Action (4 papers and discussion).

279. *Conference Proceedings, Midwest Regional Conference on Science, Technology, and State Government*, Sponsored by the National Science Foundation, Department of Health, Education, and Welfare, and State of Illinois, held at Arlington Heights, Illinois, 17-19 November 1970, 271 pp.

Reviews the Federal, regional, and state policies and mechanisms for control and implementation of science and technology; discusses (1) the relationships between environmental quality and economic development; (2) science and technology from the national, regional, and state viewpoints; and (3) problems of and



solutions to "achieving environmental quality in a developing economy". [Background Readings abstracted in *SPB*, 3(6):1065.]

1280. *Advancing Regional Development Through Science and Technology*, Report of a Science Policy Task Force, Sponsored by the National Science Foundation and the Southern Interstate Nuclear Board, 15 April 1971, 185 pp. (Available from Southern Interstate Nuclear Board, Suite 664, 800 Peachtree St., N.E., Atlanta, Ga. 30308.)  
Contains the principal findings and recommendations of a 20-month study on "interdisciplinary factors as well as inter-related patterns of science and technology influence on economic and social advancement"; although the study concentrated on the Georgia-Carolinas region, the results are applicable to multistate science and technology program planning without reference to geographical location.
1281. *Managing the Environment: Nine States Look for New Answers*, Under a grant from the Ford Foundation, April 1971, 445 pp. (Available from the Woodrow Wilson International Center for Scholars, Smithsonian Institution, Washington, D.C. 20560.)  
Describes changes initiated by the state governments of Illinois, Minnesota, Washington, Wisconsin, New York, Vermont, Maine, Maryland, and Michigan to improve management of their environments; focuses on those changes designed to give fresh impetus to existing environmental programs and on organizations created to carry out a new state responsibility, such as land-use control and waste disposal.
1282. McClellan, J. L., "Environmental Matters on the State Level", *Congressional Record*, v. 117, no. 95, 21 June 1971, pp. S9555-9557.  
Reprints an article from the *Arkansas Lawyer* (March 1971), entitled "An Ecological Perspective for Arkansas", by G. P. Smith, III, pointing out environmental threats and recommending specific actions which should be taken by the State Legislature to deal with them; Sen. McClellan points out that the article deals primarily with problems in Arkansas, but is illustrative of the interest in environmental matters on the state level in all states.
1283. *1970 Annual Report, Assembly Science and Technology Advisory Council*, State of California, 15 January 1971, 15 pp. (Available from Assembly General Research Committee, California State Legislature, Room 436, State Capitol, Sacramento, California.)  
Describes the activities of California's Assembly Science and Technology Council; presents recommendations for improving the relationships among state government, science and technology, and the environment; presents the text of H.R. 190, authorizing the formation of the Council.
1284. *Science, Technology, and State Government in Montana*, Proceedings of a Seminar Series conducted by the Governor's Interim Committee on Science and Technology in cooperation with the National Science Foundation, 1971, 162 pp. (Address inquiries to R. E. Huffman, Vice-President for Research, Montana State University, Bozeman, Montana 59715.)

~~Includes~~ papers presented at 4 seminars on the potential uses of science and technology in Montana in agriculture, forestry, mining, and government, with special emphasis on the interrelationships of environmental protection and economic development. ~~The~~ Governor's Interim Committee recommends that a position of Science Advisor to the Governor be established.

285. *Report of the New York State Science and Technology Foundation, Pursuant to Section II of Chapter 432, Laws of 1963, for the year ending December 31, 1970, 16 pp.* (Available from New York State Science and Technology Foundation, Room 612, 112 State St., Albany, New York 12207.)

Describes projects supported by the Foundation in fields such as environmental engineering, thermonuclear fusion, plasma physics, and ocean engineering; presents a breakdown of the values and purposes of grants to various receiving institutions, and a financial statement of the Foundation.

286. *Science and Technology and the State of Oklahoma, A Report to the Governor of the State of Oklahoma, prepared by the Oklahoma Task Force for Science and Technology Policy Structure, 4 March 1971, 11 pp.* (Available from Frontiers of Science Foundation of Oklahoma, 2805 Liberty Bank Bldg., Oklahoma City, Okla. 73102.)

Discusses the influence of science and technology upon our lives — the benefits of technological progress and fears aroused by technological change; stresses the importance of science and technology to state government; recommends the establishment of an Office of Science and Technology and a State Advisory Council in Oklahoma.

287. *Science, Technology and State Government, Report to Governor Buford Ellington, The State of Tennessee, by the Governor's Science Advisory Committee, January 1971, 87 pp.* (Direct inquiries to Center for Business and Economic Research, College of Business Administration, The University of Tennessee, Knoxville, Tenn.)

Discusses "the role of state government in stimulating development through science and technology"; defines the opportunities and problems associated with planned measures to increase the utilization of science and technology in Tennessee; recommends the establishment of the Tennessee Foundation for Applied Science and Technology, the Office of State Science Adviser, and A Committee for Science, Technology, and Environment in each House of the Legislature.

## SWITZERLAND

288. "Aiming at Cheap, Reliable and Adequate Energy Supplies: The Energy Policy of Switzerland", *OECD Observer*, no. 52, June 1971, pp. 36-38.

Discusses Switzerland's energy policy, which has three objectives: cheap energy, reliable supplies, and environmental protection; describes the Swiss energy resources (oil, coal, gas, and electricity) and the brisk competition and low prices resulting from the complete freedom Switzerland gives the energy industry

to import and sell electricity and fuels.

## TECHNOLOGICAL FORECASTING

1289. Sorrows, H. E., "Technology Forecasting — A Profitmaker Eliminates Blind Chance for Industry", *Commerce Today*, v. 1, no. 21, 26 July 1971, pp. 8-13.

Defines TF as "the divining of the future that technology could or will permit or cause" and discusses its importance to planning and decision making in industry and government; describes the "exploratory" approach (extrapolation from historical trends), the "normative" approach (determination of needs from examination of the future), and the techniques for formulating forecasts by these approaches.

1290. Thurston, P. H., "Make TF Serve Corporate Planning", *Harvard Business Review*, v. 49, no. 5, September-October 1971, pp. 98-102.

Examines the existing and potential linkage between technological forecasting (TF) and corporate planning, both of which seek to improve management decisions; presents nine tentative findings which could serve as guidelines to managers in utilizing TF for corporate planning decision making.

1291. Martino, J., "How to Select a Parameter", *The Futurist*, v. 5, no. 3, June 1971, pp. 115-116.

Presents 5 criteria for choosing parameters to be used in forecasting the future ability of technology to perform some useful, clearly identified function; indicates that proper selection of parameters permits useful and meaningful projections into the future of patterns derived from historical data.

## TECHNOLOGY ASSESSMENT

1292. "Technology Assessment Act of 1971", *Congressional Record*, v. 117, no. 111, 19 July 1971, pp. S11346-11350.

Introduces a bill, S. 2302, to establish an Office of Technology Assessment for the Congress as an aid in the identification and consideration of existing and probable impacts of technological applications; presents text of S. 2302 and statements by 4 of its 5 originators supporting the bill.

1293. McElheny, V. K., "Technology: Trying to be Rational", *Technology Review*, v. 73, no. 8, June 1971, pp. 12-13.

Calls attention to the fact that there are several types of technology assessment — the purely technical evaluation of the potential impact of a new technology and the "rough-and-ready judgements of the incurably emotional sphere of politics"; points out that "the issues most in need of rational assessment are those whose resolution will be only partly technical", and discusses examples.

1294. "Assessment of Technology Assessment Half-Assessed", *Industrial Research*, v. 13, no. 7, July 1971, p. 24.

Describes steps taken by NSF scientists D. E. Cunningham and B.

Bartocha to obtain data on the success of technological assessment; the final report, based on 800 replies to a questionnaire, will be entitled, "Study to Assess Technological Assessment", and is expected to provide useful guidelines for evaluating the desirability of pursuing some new technological goal.

## TECHNOLOGY TRANSFER

295. Roush, J. E., "A Bill to Promote Technology Utilization", *Congressional Record*, v. 117, no. 97, 23 June 1971, pp. H5825-5826.

Rep. Roush discusses the importance of efficient technology transfer and introduces legislation (H.R. 9379) to establish the Office for Technology Transfer, which would take over the present technology-utilization activities of other Government agencies and thereby effect unification of efforts.

296. Thompson, R. A., "Space: Steppingstone to a Better Earth", *Ecology Today*, v. 1, no. 5, July 1971, pp. 31-32, 45.

Gives many examples of how space exploration has led to material benefits on earth, and concludes that "most important, it has related man in evolutionary survival . . . to his delicate environment on planet, Earth, . . . and to a fascinating, precious relationship with all other creatures who call that planet home".

297. Bean, A. L., "The Value of Manned Flights to the Moon", *Impact of Science on Society*, v. 21, no. 2, April-June 1971, pp. 105-112.

Astronaut Bean explains the tangible benefits of space exploration to technology, education, and medicine, and the intangible benefits in restoring U.S. pride and prestige, bringing the world's peoples closer together; and making life on earth more meaningful.

298. *Application of Aerospace and Defense Industry Technology to Environmental Problems*. Hearings before a Subcommittee of the Committee on Government Operations, U.S. House of Representatives, 23-24 November 1970, 259 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: \$1.00.)

Presents testimony and documents concerning the possibility of converting idle aerospace resources to the task of environmental protection; includes opinions and recommendations by witnesses from both industry and Government concerning feasibility, organization, funding, and techniques of conversion.

299. Eilberg, J., "The Conversion Research and Education Act of 1971", *Congressional Record*, v. 117, no. 128, 8 September 1971, pp. E9272-9273.

Rep. Eilberg describes the economic implications of providing jobs in R&D for the unemployed scientists and engineers; discusses parts of the Conversion Research and Education Act, H.R. 4122, and the National Economic Conversion Act, H.R. 5204.

300. Humphrey, H. H., "Reducing Aerospace Unemployment by Retraining Engineers for Jobs in Government: A League of Cities/Conference





of Mayors Pilot Project", *Congressional Record*, v. 117, no. 88, 10 June 1971, pp. S8853-8854.

Describes the League of Cities and Conference of Mayors project, funded jointly by the Departments of Labor and of Housing and Urban Development and formed to select unemployed trained scientists and engineers from 7 geographical areas and reorient them to meet the management needs of state and local governments.

1301. Fronko, E. G., "One Company's Cast-off Technology is Another Company's Opportunity", *Innovation*, no. 23, August 1971, pp. 52-59.

Describes General Electric's program, the Technology Marketing Operation, established to market GE's excess technology, such as processes, proprietary know-how, and unprofitable (to GE) product lines.

## TRANSPORTATION

1302. Percy, C. H., "The Need for a Balanced Transportation Policy", *Congressional Record*, v. 117, no. 111, 19 July 1971, pp. S11359-11363.

Sen. Percy cites FY 1971 Federal outlays for transportation to illustrate the imbalance: 2.8% for mass transit and 62.9% for highways; presents an article from *Saturday Review* (June 5) discussing the doubtful nature of U.S. transportation policies, particularly with regard to the Highway Trust Fund, and points the way to developing a transportation policy sensitive to environmental constraints and to public needs.

1303. Humphrey, H. H., "DOT Fails to Submit National Transportation Policy Statement", *Congressional Record*, v. 117, no. 114, 22 July 1971, pp. S11854-11855.

Calls attention to the fact that Title I, Sec. 3, of the Airport and Airway Development Act of 1970 requires the Secretary of Transportation to "formulate and recommend to the Congress for approval a national transportation policy" within 1 year after the date of enactment (May 21, 1970), and that this has not yet been done; Sec. 3 is reprinted verbatim.

1304. "Transportation's Troubled Abundance", *Fortune*, v. 84, no. 1, July 1971, pp. 59-62, 137-139.

Examines national spending for transportation developments, overwhelmingly dominated by the private automobile; discusses the pros and cons of several alternative forms of urban transportation to overcome problems created by automobiles; brands the Interstate Commerce Commission as the administrator of a "great freight cartel", costing users millions in excessive rates, in inefficiencies from operating at only a fraction of capacity, and in extortion by organized labor.

1305. Alioto, J., "Balanced Transportation to Revive the Cities", *Astronautics & Aeronautics*, v. 9, no. 8, August 1971, pp. 14, 59-61.

San Francisco's Mayor Alioto examines the transportation

problem facing the urban community; cites the imbalance between percentage of total transportation expenditures for automobiles and that for all urban public transportation (81% and 2%, respectively); suggests ways in which unemployed scientists and engineers from other fields can apply their talents to the urban transportation problem.

306. "Remarks by U.S. Secretary of Transportation John A. Volpe", *Congressional Record*, v. 117, no. 130, 10 September 1971, pp. E9413-9414.

Mr. Volpe, addressing the Fifth International Conference on Urban Transportation, announced a \$60 million grant for a rapid transit system in Pittsburgh; speech also describes national efforts to increase urban mobility.

307. Mikva, A. J., "Cars Versus Mass Transit — Competing for the Commuter's Custom", *Congressional Record*, v. 117, no. 104, 7 July 1971, p. E7093.

Includes a statement by Theodore W. Kheel, presented at a Conference on Public Transportation, which describes the conflict between the private car and the public bus; discusses the adverse interactions of the two types of transportation and the dilemma of General Motors, the largest maker of both cars and busses.

308. Vanik, C. A., "Mass Transit", *Congressional Record*, v. 117, no. 89, 11 June 1971, pp. E5723-5724.

Rep. Vanik discusses the urgent need for mass transit; and cites some of its advantages, including less pollution, increased safety, and lower cost to individual riders; is cosponsoring a bill to create a Transportation Trust Fund to obtain monies for mass transit.

309. Pickle, J. J., "Rails for the Future", *Congressional Record*, v. 117, no. 87, 9 June 1971, p. E5619.

Rep. Pickle describes U.S. efforts toward developing high-speed rail transportation and presents an editorial outlining W. German efforts to develop an intercity train designed to travel up to 350 mph; the German train is viewed as the answer to the problem of congested and polluted highways and airplanes.

310. Aug, S. M., "Amtrak Chief Looks Ahead After First Month on Job", *Congressional Record*, v. 117, no. 89, 11 June 1971, pp. S8896-8897. (Reprinted from *Washington Evening Star*, 9 June 1971.)

Interviews Mr. R. Lewis, President of the National Railroad Passenger Corporation (Amtrack) on the first month's operation of the new rail system; discusses such items as the future of Amtrack, money worries, competition, objectives, and responsibilities.

311. "Ministerial-Level Parley Initiates Joint Aerosat Development Plan", *Aviation Week & Space Technology*, v. 94, no. 26, 28 June 1971, p. 21.

Announces a meeting of an International Collaboration Ad Hoc Group (representing U.S., West Europe, Canada, Japan, and Possibly Australia) on July 15-17 at the European Space

Technology Center (ESTEC) in Noordwijk, Netherlands, to begin plans to "develop and test a pre-operational aeronautical satellite system over both the Atlantic and Pacific", which will allow an aircraft with a single type of equipment to navigate in any geographical area.

1312. Winston, D. C., "Administration Yields on Trust Fund Use", *Aviation Week & Space Technology*, v. 94, no. 26, 28 June 1971, pp. 20-21.

Describes the Sen. Cannon's criticism of the Nixon Administration for failure to allocate enough of the FY 1972 aviation user tax revenues to meet the minimum amount (\$280 million) required by the 1970 Airport and Airway Development Act for capital improvements and expansion of airports and airways; reports Administration agreement and outlines current FAA plans for use of the money.

1313. *Civil Supersonic Aircraft Development (SST)*, Hearings Before a Subcommittee of the Committee on Appropriations, House of Representatives, 1971, 709 pp. (Available from the U.S. House of Representatives, Committee on Appropriations, Washington, D.C. 20515.)

Presents the record of hearings held last March to consider continuation of appropriations to the Department of Transportation and related agencies for FY 1971; deals primarily with arguments pro and con on Government funding for the SST, based mainly on environmental and economic implications.

1314. Mitchell, P. J., "SST Struggle not Over", *Congressional Record*, v. 117, no. 101, 30 June 1971, pp. H6200-6201.

Rep. Mitchell introduces and supports a bill (H.R. 8760) to prohibit any flights to the U.S. by commercial supersonic transports; presents statement which points out the environmental and economic dangers of using foreign-built SST's for service to the U.S.

1315. Talbert, A. E., "Dassault Ought to Know!", *Congressional Record*, v. 117, no. 98, 24 June 1971, p. E6480. (Reprinted from *Air Transport World*, May 1971.)

Considers the optimistic predictions of M. Dassault, French aerospace-industry builder and industrialist, concerning the success of the French Concorde SST and the continuing development of supersonic transports.

## UNITED KINGDOM

1316. Smith, A., "How is Science Policy Made in Britain?", *Science Forum*, v. 4, no. 4, August 1971, pp. 14-15.

Describes an attempt to discover how the British Government determines science policy, which led to only one conclusion: that the government muddles along, "making decisions that seem right to their political judgment at that time", in spite of an excess of scientific advisers and advice.

1317. Croome, A., Sherwood, M., and Valery, N., "Whitehall's Call for



Relevant Science", *New Scientist and Science Journal*, v. 50, no. 756, 17 June 1971, pp. 672-673.

Discusses the ongoing reappraisal of Britain's five scientific research councils — Agricultural (ARC), Medical (MRC), Science (SRC), Natural Environment (NERC), and Social Science (SSRC) — currently under the Department of Education and Science; speculates on possible recommendations in the as-yet-unpublished "Dainton report" by a committee set up by the Council for Scientific Policy to look into the structure of research council science; brings in jurisdictional changes in R&D activities of the Defense Ministry and the Department of Trade and Industry.

318. Hawkes, N., "Britain: Successor to 'Mintech' Loses Jurisdiction over Research", *Science*, v. 173, no. 3991, 2 July 1971, pp. 34-36.

Discusses the dismantling of much of Britain's Ministry of Technology by the conservative British government; considers the possible effects of the government's preference for diversified research, and describes the new, apparently "mission-oriented" policy as it pertains to future Ministerial research.

319. Haigh, G. E., et al., "NPDCC and the Environment for Innovation", *Nature*, v. 232, no. 5312, 20 August 1971, pp. 527-531.

Describes the historical development in Britain of the National Research Development Corporation to develop or exploit inventions resulting from public research, the difficulties experienced, and the environment in which it now operates.

320. "British Find Causes for R&D Project Failure", *Industrial Research*, v. 13, no. 9, September 1971, p. 17.

Reveals that the chief reason for Britain's shelving of some of its R&D projects, as determined by a survey by Britain's new Center for the Study of Industrial Innovation, is inadequate preassessment of the market demand; the survey report concludes that "two-way liaison between research and development departments and marketing" is needed.

321. "Prosperity and Science as Chicken and Egg", *Nature*, v. 233, no. 5315, 10 September 1971, pp. 77-78.

Discusses the reactions to Sir Alec Cairncross's statement that "postwar British government may have been misguided in supposing that investment in scientific R&D would insure prosperity and competitiveness with advanced economies"; discusses a speech by Sir Brian Flowers, chairman of the Science Research Council, describing anticipated effects of entry into the European Community on British policy for R&D.

322. Sherwood, M., "Government Pay Goads the Scientists", *New Scientist and Science Journal*, v. 51, no. 763, 5 August 1971, pp. 306-308.

Describes the sensitive situation created by the British government's recent no-pay-increase policy for many Civil-Service scientists; discusses some of the underlying issues.

323. Sherman, B., "Why is There a Science Jobs Crisis?", *New Scientist and Science Journal*, v. 51, no. 765, 19 August 1971, pp. 415-416.

Describes employment difficulties facing British university

graduates in scientific and engineering fields as a result of the depressed economy and lesser demand for research scientists — especially pure scientists, whose training is too specialized to fit them for management positions.

1324. "A Question of Degree", *Nature*, v. 233, no. 5315, 10 September 1971, p. 84.

Reports on discussions at Britain's biennial Standing Conference of University Appointments Services (SCUAS), concerning possible changes in the educational system that would provide students (particularly in the sciences) with a broader education to make them more employable; also discusses the possibilities of a computer matching service and a centralized university placement organization.

1325. "Black Arrow Scrapped", *Nature*, v. 232, no. 5310, 6 August 1971, pp. 362-363.

Describes the British Government's scrapping of its Black Arrow satellite-launcher program, apparently because it did not represent a good economic investment; notes a suggestion by the U.S. Government that European nations contribute at least 10% towards the development of a post-Apollo program, which would pave the way for NASA to launch European applications satellites.

1326. "Aldermaston March", *Nature*, v. 232, no. 5312, 20 August 1971, pp. 513-514.

Explains the strong stand of the Executive Committee of the British Society for Social Responsibility against the transfer of the Atomic Weapons Research Establishment at Aldermaston from the U.K. Atomic Energy Authority to the Ministry of Defence; speculates that the U.K. may abolish the AEA as such, leaving the Atomic Energy Research Establishment at Harwell as a "self-contained concern".

## URBAN PROBLEMS

1327. Beckman, N., "Development of National Urban Growth Policy", *Congressional Record*, v. 117, no. 86, 8 June 1971, pp. S8494-8500. (Reprinted from *American Institute of Planners Journal*, May 1971.)

Reviews Federal and state legislative actions during 1970 to deal with the development of the urban community; outlines Congress' national urban growth policies and discusses planning and development in such areas as transportation, solid wastes, health, safety, water supply, population growth, unemployment, housing, environmental considerations, and government.

1328. *National Conference on Urban Water Research*, Sponsored by the Office of Water Resources Research, U.S. Department of the Interior, Keynote and Plenary Session Papers, Georgia Institute of Technology, Atlanta, Georgia, 17-19 March 1970, 31 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 25 cents.)

Papers deal with natural resource development in the urban

environment, social consequences, economic consequences, and engineering alternatives for the development of city water resources; program and participants are listed in appendixes.

9. *A National Urban Water Resources Research Program*, Office of Water Resources Research, U.S. Department of the Interior, Washington, D.C., 1971, 54 pp. (Available from U.S. Government Printing Office, Washington, D.C. 20402. Price: 35 cents.)

Proposes a program in urban water-resources research designed to improve water-resources management in the urban environment by employing expertise in physical, biological, social, and engineering sciences; this report, by the Office of Water Resources Research (OWRR), identifies and justifies high-priority and key research needs in urban water resources management.

10. "The Cities and Aerospace: Cold Comfort", *Astronautics & Aeronautics*, v. 9, no. 8, August 1971, pp. 62-63, 66-67.

Presents remarks from papers presented at the Urban Technology Conference (UTC), emphasizing the need by cities and regions for modern engineering planning and services in such areas as transportation, community development, and pollution control; suggests utilizing the capabilities of the unemployed scientists and engineers in developing badly needed urban systems.

## U.S. SCIENCE POLICY

11. Brooks, H., "Is There a Science Policy in the United States?" (in French), *La Recherche*, no. 14, July-August 1971, pp. 611-614.

Consists of a question-and-answer interview in which Brooks comments on such topics as the plight of the U.S. scientific-technical community, training of science managers, and worldwide scientific cooperation between developed and developing nations; an insert briefly reviews the recently released OECD report (Ref. 1234), *New Concepts of Science Policy*, the product of a 2-year effort by a task force under the direction of Dr. Brooks.

12. "Davis Committee Exposes the Problems", *Nature*, v. 232, no. 5310, 6 August 1971, pp. 364-365.

Notes the intention of the Science, Research and Development Subcommittee of the House Committee on Science and Astronautics to study science, technology, and the economy; discusses one of the chief factors to be considered, viz., the decelerating growth in expenditures on R&D, and the policies needed to stimulate the economy and reverse the slide in the U.S. trade balance; presents suggestions by M. H. Stans, Secretary of Commerce, and discusses restrictions imposed by the antitrust laws.

13. Kreilkamp, K., "Hindsight and the Real World of Science Policy", *Science Studies*, v. 1, no. 1, January 1971, pp. 43-66.

Discusses Project Hindsight, initiated in 1963 by the U.S. Department of Defense (DoD) to evaluate its R&D programs, utilizing as a criterion the number of "Research Events" (or technological innovations) produced by R&D in relation to dollars spent;

summarizes Hindsight's findings in 3 aspects of DoD research: cost-effectiveness, utilization, and production, and delineates 5 types of biases in the Events approach; points out other flaws in the Events model and in Hindsight's findings of a dismally poor return from basic research; presents some positive methodological tips for policy makers and analysts of science policy.

1334. *Science & Government Report*, v. 1, no. 13, 15 September 1971, pp. 1, 4.

Lead article reports on Presidential Science Adviser David's reaction to Nixon's promise to present "programs to insure maximum enlistment of America's technology in meeting the challenges of peace"; predicts increased R&D on transportation, housing, health care, cancer, and clean energy, as well as prototype development and demonstration projects; discusses political aspects of the scientist-engineer unemployment situation.

1335. Wade, N., "Nixon's New Economic Policy: Hints of a Resurgence for R&D", *Science*, v. 173, no. 3999, 27 August 1971, pp. 794-796.

Describes the differences of opinion among Federal agencies and prominent individuals on the need and techniques for stimulating industrial R&D (tax incentives supported by President Nixon, Federal subsidies supported by the Commerce Department and opposed by the Treasury, or the middle-road position held by the Office of Management and Budget and the Office of Science and Technology).

1336. Hollomen, J. H., and Harger, A. E., "America's Technological Dilemma", *Technology Review*, v. 73, no. 9, July/August 1971, pp. 31-40.

Analyzes the impact on industry of the U.S. Government's accelerating investment in R&D in the 1950's and deceleration in the 1960's; discusses the effects of industry's underinvestment in R&D on productivity, employment, and, consequently, the U.S. trade balance; cites two components of the policy change necessary if trends in U.S. spending are to be changed and the trade balance restored.

1337. Nelson, R. R., "World Leadership', the 'Technological Gap' and National Science Policy", *Minerva*, v. 9, no. 3, July 1971, pp. 386-399.

Examines the "technological gap" between Europe and the U.S. which has "existed for upwards of 100 years"; argues that retention of U.S. world leadership is not an adequate criterion on which to base national science policy.

1338. "Technology Possible Key to Trade Balance Problems, Secretary Stans Says", *U.S. Department of Commerce News*, Office of the Secretary, Washington, D.C. 20230, G 71-120, 27 July 1971, 2 pp.

Points out that the U.S. faces a probable trade deficit in 1971, and blames the "relative decline in U.S. technological strength"; suggests that the government may have to assist civilian technological development if the U.S. is to maintain its advantage in many areas of technology.

1339. Magruder, W. M., "SST: Lessons in All That Pain", *Astronautics &*



*Aeronautics*, v. 9, no. 7, July 1971, pp. 16-18.

Reviews 5 lessons that might be drawn from the defeat of the SST: (1) it was not caused by lack of technological expertise, (2) research must be done beforehand to prove convincingly the effectiveness of environmental safeguards in any technological advancement, (3) every new development must be justified through open communication with Congress and the public, (4) public respect and understanding are essential to restore the tradition of government-industry partnership in transportation progress, and (5) the industry must make sure that legislators are sufficiently well informed to preclude their drawing false conclusions; predicts that the U.S. aviation industry "will be left at the starting gate" in the SST era now beginning.

340. Logsdon, J. M., *The Decision to Go to the Moon: Project Apollo and the National Interest*, M.I.T. Press, Cambridge, Mass., 1970, 188 pp. (\$10.00)

Pulls together much of the publicly available information on events surrounding President Kennedy's decision in May 1961 to commit the U.S. to a manned lunar landing before 1970; concludes from Apollo's success "that it is possible, under a specific set of conditions, to use the 'Apollo approach' of setting a dramatic goal for accomplishment by a given time as a means of attacking other national problems".

#### U.S.S.R.

341. "Tasks of Soviet Science", *Science Policy News*, v. 2, no. 6, May 1971, pp. 75-76.

Reports on a speech by M. Keldysh, president of the Soviet Academy of Sciences, at the 24th Congress of the Soviet Communist Party on 1 April, stressing the need for R&D toward advancements in computers, automation, quantum electronics, and the design of nuclear power stations; also suggests that space developments should be adapted for such practical things as communication, meteorology, navigation, and studying natural resources.

342. White, S., "Science v. the Bureaucrats", *New Scientist and Science Journal*, v. 51, no. 762, 29 July 1971, pp. 252-253.

Reviews Zhores Medvedev's 2-part book, *The Medvedev Papers*, which analyzes the organization of science in general, describes the author's experiences as a Soviet scientist, analyzes the facts and consequences of international scientific cooperation, and outlines civil rights and legislation on travel abroad and state frontiers; a second part discusses Soviet censorship of correspondence with the rest of the world.

343. "R&D Wage Incentives: Soviet Style", *Industrial Research*, v. 13, no. 9, September 1971, p. 21.

Describes the introduction of the U.S.S.R.'s economic reform policies (incentives and material encouragement) in its R&D establishments; the scientists' research efficiency is now assessed by means of a ten-point system, and their salaries are adjusted accordingly.

1344. "USSR: Guidelines for Science and Industry", *Science Policy News*, v. 3, no. 1, July 1971, p. 15.

M. Lavrentiev, president of the Siberian branch of the USSR Academy of Sciences, notes the aim of Novosibirsk's "Science City" and the progress made toward achieving it; discusses the need for more scientific-industrial complexes, better coordination and interchange among research centers, and training of scientists aware of society's needs; proposes that comprehensive training plans be drawn up as guidelines for education ministries.

1345. Salomon, S. N., "A Year in Siberian Science", v. 73, no. 9, *Technology Review*, July/August 1971, pp. 10-11.

A former exchange scientist at Novosibirsk State University in Akademgorodok, the center of the Siberian branch of the U.S.S.R. Academy of Sciences, describes the University and its science-oriented curricula, the admission and financial-aid system, and the communication among students, teachers, and administrators.

1346. Abelson, P. H., "Geophysicists in Moscow: signs of Easier Relations", *Science*, v. 173, no. 3999, 27 August 1971, pp. 797-800.

Discusses the hospitality shown to U.S. scientists attending the 15th general assembly of the International Union of Geodesy and Geophysics in Moscow, 1-14 August 1971, by their Russian counterparts; reviews impressions and experiences of U.S. visitors regarding life in the Soviet Union.

1347. "Scientific-Technical Progress in Siberia", Report JPRS 52889, 15 April 1971, pp. 1-6. (Translation of "The Main Lines of Siberian Science", by M. Labrent'yev, *Izvestiya*, 13 February 1971, p. 3. Available from National Technical Information Service, Springfield, Va. 22151. Price: \$3.00.)

The Chairman of the Siberian Department of the USSR Academy of Sciences examines the technological progress of Siberia during the present Five-Year Plan, and describes some of the more effective agencies and institutes operating in the Siberian region.

1348. "Development of Siberia and Far East", *Science Policy News*, v. 2, no. 6, May 1971, p. 75.

Describes plans to set up additional research institutes in Siberia and the Soviet Far East under the Far East scientific centre, established "to promote the rapid development of natural sciences and humanities in the interests of the economy and productive forces of the region" and to coordinate the training of young scientists; in 1971-1975, rapid development of industries (mining, fishing, oil, gas, metallurgy, chemicals, timber, and power) is expected in this region.

1349. Gillette, R., "Nuclear Power in the U.S.S.R.: American Visitors Find Surprises", *Science*, v. 173, no. 4001, 10 September 1971, pp. 1003-1006.

Describes the great nuclear power advances of the U.S.S.R. — where fast-breeder reactor development is well ahead of U.S. and European efforts and a program is underway to build a unique family of huge, nonbreeding uranium-graphite reactors that are

claimed to be safer and more economical than others.

## WEST GERMANY

350. "Germany: Conference on Special Research Areas", *Science Policy News*, v. 2, no. 6, May 1971, p. 72.

Mentions proposals outlined at a conference of the German Research Association Senate Committee for Special Research Areas, dealing with cooperation between academic and non-academic institutions in research; priority research fields chosen by the Senate for 1971 study (at a budget of DM 100 million) include sociology of industrial relations, artificial organs for humans, plane load-bearing structures in building techniques, multiple sclerosis, livestock farming methods, and digital data transmission.

351. "West Germany: Legislation to Encourage Post-graduate Education", *Science Policy News*, v. 3, no. 1, July 1971, p. 8.

Describes a proposed bill to provide 5000 young graduate scientists with scholarship assistance and improve the training facilities at the centers of higher education; the bill calls for DM 34.6 million for this purpose, compared with DM 31.2 million provided by the 1971 budget.

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BioScience	Science
Bulletin of the Atomic Scientists	Science & Government Report
Chemical and Engineering News	Science Forum
Congressional Record	Science News
Environment	Science Policy News
Environment Report	Science Studies
Environmental News	Scientific American
Foreign Affairs	Scientific and Technical Reports (NASA)
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