NATIONAL RESEARCH COUNCIL

NATIONAL ACADEMY OF SCIENCES NATIONAL ACADEMY OF ENGINEERING

2101 CONSTITUTION AVENUE WASHINGTON, D.C. 20418

DIVISION OF PHYSICAL SCIENCES
ASTRONOMY SURVEY COMMITTEE

July 1, 1971

Dr. Carl York
Office of Science and Technology
Room 282
Executive Office Building
Washington, D. C.

Dear Dr. York:

The following is in response to your request of June 30 for a statement on the charge to the Astronomy Survey Committee. A formal request for the study was made in a letter dated January 22, 1969 from Leland J. Haworth, then director of the National Science Foundation, to Harvey Brooks, Chairman of the Academy's Committee on Science and Public Policy. That letter asked for an independent study to assess the priorities of astronomy from the scientific point of view, cutting across the lines of agency responsibilities. In response to this request, COSPUP established an ad hoc working group to consider the question; the group concluded that a study should be pursued in response to Dr. Haworth's letter. Following this decision, Dr. Jesse L. Greenstein was asked by the President of the Academy, then Dr. Frederick Seitz, to chair a study under the auspices of the National Research Council to determine the status and future requirements of ground-based astronomy, focused on the question of priorities for major facilities. There was then considerable discussion between Greenstein and senior members of the astronomical community as to the best way in which this study could proceed. Unfortunately, the majority of this took place in person, via telephone, or via private correspondence. I am, therefore, unable to provide you with a formal statement of the charge to the Committee as it was developed among the principals. In fact, even the agreement among the members of the Committee to serve on the Committee was initially achieved by Greenstein through direct communications. The letter of appointment to members, signed by President Handler, merely states that "the study group is being established to examine the current state of astronomy." As it developed, the manner in which the Committee should respond to the request to undertake a study of astronomy, to follow the original COSPUP

study, Ground-Based Astronomy, a Ten-Year Program, the Whitford report, was discussed in considerable length during the course of early meetings of both the Committee and its panels.

I am enclosing the list of members of the Committee and its panels.

I regret that I can not be more helpful in supplying you with a more detailed description of a charge to the Committee, but I fear that the problem is that no specific formal charge exists. If I can be of any further assistance, please feel free to call on me.

Very truly yours,

Bruce N. Gregory

Bruce N. Gregory

BNG:kd

Enclosure

MEMBERSHIP
ASTRONOMY SURVEY COMMITTEE

Steering Committee

Dr. Jesse L. Greenstein (Chairman) - California Institute of Technology
Dr. Helmut Abt - Kitt Peak National Observatory
Dr. Jacques Beckers - Sacramento Peak Observatory
Dr. Geoffrey Burbidge - University of California, San Diego
Dr. Bernard F. Burke - Massachusetts Institute of Technology
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Dr. F. D. Drake - Cornell University
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Dr. Arthur Code - Kitt Peak National Observatory
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Dr. I. J. Danziger - Harvard College Observatory
Dr. John T. Jeffries - University of Hawaii
Dr. Robert P. Kraft - Lick Observatory, University of California, Santa Cruz
Dr. Donald C. Morton - Princeton University Observatory
Dr. C. R. O'Dell - Yerkes Observatory
Dr. J. B. Oke - California Institute of Technolgoy

Optical Panel (Cont'd)

Dr. George W. Preston - Hale Observatories
Dr. Stephen E. Strom - State University of New York
Dr. William F. van Altena - Yerkes Observatory
Dr. Ray J. Weymann - Steward Observatory
Dr. George Wallerstein - University of Washington
Dr. Allan Sandage (Consultant) - Hale Observatories

Radio Panel

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Dr. Marshall H. Cohen - California Institute of Technology
Dr. F. D. Drake - Cornell University
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Dr. James W. Warwick - University of Colorado
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Dr. Robert F. Howard - Mt. Wilson & Palomar Observatories
Dr. Icko Iben, Jr. - Massachusetts Institute of Technology
Dr. Werner M. Neupert - Goddard Space Flight Center
Dr. Robert W. Noyes - Harvard College Observatory
Dr. N. R. Sheeley - Kitt Peak National Observatory
Dr. Edward A. Spiegel - New York University
Dr. James W. Warwick - University of Colorado
Dr. J. B. Zirker - University of Hawaii

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Dr. A. G. W. Cameron (Chairman) - Yeshiva University
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Dr. Robert O. Doyle - Harvard College Observatory
Dr. Richard Goody - Harvard College
Dr. Robert J. Gould - University of California, San Diego
Dr. Richard Huguenin - University of Massachusetts
Dr. J. P. Jokipii - California Institute of Technology
Dr. D. P. McNutt - Naval Research Laboratory
Dr. Tobias Owen - State University of New York
Dr. J. B. Zirker - University of Hawaii

Statistical Panel

Dr. Geoffrey Keller (Chairman) - Ohio State University
Dr. Richard E. Berendzen - Boston University
Dr. R. O. Doyle - Harvard College Observatory
Dr. Frank K. Edmondson - Indiana University
Dr. W. E. Howard - National Radio Astronomy Observatory
Dr. J. P. Ostriker - Princeton University Observatory

X-ray, Gamma-ray Panel

Dr. Herbert Friedman (Chairman) - Naval Research Laboratory
Dr. Giovanni G. Fazio - Smithsonian Astrophysical Observatory
Dr. Riccardo Giacconi - American Science & Engineering, Inc.
Dr. Robert J. Gould - University of California, San Diego
Dr. Kenneth Greisen - Cornell University
Dr. William Kraushaar - University of Wisconsin
Dr. Bruno B. Rossi - Massachusetts Institute of Technology
Dr. F. D. Seward - University of California, Livermore

Astrophysics and Relativity Panel

Dr. George B. Field (Chairman) - University of California, Berkeley
Dr. Geoffrey Burbidge - University of California, San Diego
Dr. George W. Clark - Massachusetts Institute of Technology
Dr. Donald D. Clayton - Rice University
Dr. R. H. Dicke - Princeton University
Dr. Kenneth Kellerman - National Radio Astronomy Observatory
Dr. Charles Misner - University of Maryland
Dr. Eugene N. Parker - University of Chicago
Dr. Edwin E. Salpeter - Cornell University
Dr. Maarten Schmidt - California Institute of Technology
Dr. Steven Weinberg - Massachusetts Institute of Technology

Theoretical Astrophysics Panel

Dr. Geoffrey Burbidge (Chairman) - University of California, San Diego
Dr. Peter Goldreich - California Institute of Technology
Dr. Philip Solomon - Columbia University
Dr. Edward A. Spiegel - Columbia University
Dr. P. Strittmatter - University of California, San Diego
Dr. Stephen E. Strom - State University of New York
Dr. Russell Kulsrud - Princeton University Observatory) Consultants
Dr. Donat Wentzel - University of Maryland)

Theoretical Astrophysics Panel (Cont'd) - Working Group, Computers

Dr. David Arnett - Rice University
Dr. Morris Davis - University of North Carolina
Dr. Pierre Demarque - Yale University
Dr. Dimitri Mihalas - Yerkes Observatory
Dr. Richard H. Miller - Kitt Peak National Observatory

- Contributors to Panel

Dr. Charles Barnes - California Institute of Technology
Dr. Stanley Bashkin - University of Arizona
Dr. Alexander Dalgarno - Harvard College Observatory
Dr. Karl Kessler - U. S. Bureau of Standards
Dr. Marvin A. Ruderman - Columbia University
Dr. Patrick Thaddeus - Institute for Space Studies
Dr. Ward Whaling - California Institute of Technology

Working Group on Planetary Astronomy

Dr. Tobias Owen (Chairman) - State University of New York
Dr. Richard M. Goldstein - Jet Propulsion Laboratory
Dr. Richard Goody - Harvard College
Dr. Thomas McCord - Massachusetts Institute of Technology
Dr. Guido Munch - Mt. Wilson & Palomar Observatories
Dr. Elizabeth Roemer - University of Arizona
Dr. Carl Sagan - Cornell University
Dr. Irwin Shapiro - Massachusetts Institute of Technology

News Report

NATIONAL ACADEMY OF SCIENCES • NATIONAL ACADEMY OF ENGINEERING
INSTITUTE OF MEDICINE • NATIONAL RESEARCH COUNCIL

Pests and Pesticides: Deciding Between Them

In 1972 the administrator of the U.S. Environmental Protection Agency canceled most uses of DDT, and explained that available data "have established at the very least the risk of the unknown." Although he drew upon a large body of information, his decision illustrates a dilemma common to environmental problems. Evidence is often incomplete and conflicting and stakes are high. If nontechnical considerations are part of such decisions, how can available scientific information best be used? A new study in the Board on Agriculture and Renewable Resources, of the National Research Council's Commission on Natural Resources, is intended to shed light on this question as it relates to pest control.

The Study on the Acquisition and Use of Scientific and Technical Information in Pest Control Regulatory Decision-Making at the Federal and State Level is funded by the U.S. Environmental Protection Agency. It is one of several studies on the use of scientific information in regulatory decision, undertaken for the Environmental Protection Agency by the Commission on Natural Resources.

Headed by W. G. Eden, professor of biology at Lawson Community College in Birmingham, Al., a study committee will look at the place of science and technology in regulation of pesticides and the effects of policies and regulations on pest control. Major issues include:

- The scientific method is sometimes viewed as incompatible with the adversary system of the law. Because regulations are written to undergo legal testing, what are the responsibilities of the scientific, legal, and administrative communities in understanding technical issues in the regulatory process?
- The Federal Environmental Pesticide Control Act of 1972 provides that when a decision to cancel or suspend a pesticide is appealed, the scientific evidence may be referred to a panel established by the National Academy of Sciences. The provision has raised questions of how best to

(continued on page 2)

Detlev W. Bronk 1897-1975

Detlev Wulf Bronk, president of the National Academy of Sciences from 1950 to 1962, died November 17, 1975, in New York City, of complications following a mild stroke. The following statement was issued on behalf of the National Academy of Sciences by Philip Handler, president.

The sudden death of Detlev Bronk comes to this institution as a deeply felt personal shock. Although the Academy was only one of several institutions to thrive under his vigorous leadership—among them The Rockefeller University, The Johns Hopkins University, and the National Science Board—we cherish our special memories. During his three years as our foreign secretary, from 1947 to 1950, he created new patterns for international cooperation in science. In his 12 years as president, from 1950 to 1962, he brought the Academy to unprecedented levels of service to science, to the Federal Government, and to the general public. In the years that followed he was our constant friend and guide.

Those who know the recent history of the Academy understand how much it is an expression of the wisdom, dedication, and vision of this one man. It will take time to accept the loss and consider how his many years of leadership of this institution and of the national scientific enterprise can best be memorialized.

Science and Social Values

In *The Common Sense of Science,* Jacob Bronowski wrote "The great revolutions in outlook are long in the making, and at last they change all our ways of thought. But the change strikes first in one field of knowledge, which has a special place in the social and intellectual life of the day." What are the present revolutions in science that will influence future thinking?

Such is the starting point for a series now in progress, of four, half-day public meetings by the Academy Forum of the National Academy of Sciences. Entitled "A Series of Forums in a Bicentennial Context," the meetings are intended to explore the broad effects of scientific theories and knowledge.

This Forum series began in November 1975 with "Scientific Theories and Social Values," examining the validity of claims that science has shaped values and asking whether modern science portends similar change.

Issues underlying the second Forum, "The Citizen and the Expert," January 20, include the responsibilities of the scientist as originator of ideas, in relation to the public, which translates and acts on them.

"Frontier Expansion or Inward Development," March 16, will look at current choices between the search for new fields of knowledge and management of established areas.

The series will end in May with "Rude Colony to Dominant Power," broadly exploring the future of science and society.

Each of the meetings, held in the National Academy of Sciences building, is organized around a panel of speakers, invited discussants, and public interaction.

News Report is a register of activities of the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council.

February 1976 • Volume XXVI, Number 2

Part I of two parts

New Projects

The following new projects are announced by the Institute of Medicine and units of the National Research Council.

ASSEMBLY OF LIFE SCIENCES

Medical and Biologic Effects of Environmental Pollutants: Ammonia. Subcommittee on Ammonia, Committee on Medical and Biologic Effects of Environmental Pollutants, Division of Medical Sciences; Henry Kamin, professor of biochemistry, Duke University Medical Center, chairman; U.S. Environmental Protection Agency, sponsor.

Medical and Biologic Effects of Environmental Pollutants: Iron. Subcommittee on Iron, Committee on Medical and Biologic Effects of Environmental Pollutants, Division of Medical Sciences; Clement A. Finch, professor of medicine and head of the Division of Hematology, University of Washington School of Medicine, chairman; U.S. Environmental Protection Agency, sponsor.

VII International Congress on Photobiology Travel Grants. U.S. National Committee for Photobiology, Division of Biological Sciences; Anthony San Pietro, professor of plant sciences, Indiana University, chairman; National Cancer Institute, initial sponsor.

COMMISSION ON NATURAL RESOURCES

The Acquisition and Use of Scientific and Technical Information in Pest Control Regulatory Decision-Making at the Federal and State Levels. Board on Agricultural and Renewable Resources; W. G. Eden, professor of biology, Lawson Community College, Birmingham, Al., chairman; U.S. Environmental Protection Agency, sponsor.

A Multimedia Approach to Municipal Sludge Management. Environmental Studies Board; Harvey O. Banks, president, Harvey O. Banks, Consulting Engineer, Inc., Belmont, Ca., chairman; U.S. Environmental Protection Agency, sponsor.

Panel on Low Molecular Weight Halogenated Hydrocarbons. Coordinating Committee on Scientific and Technical Assessments of Environmental Pollutants, Environmental Studies Board; Julian B. Andelman, Graduate School of Public Health, University of Pittsburgh, chairman; U.S. Environmental Protection Agency, sponsor.

Panel on Nitrates. Coordinating Committee on Scientific and Technical Assessments of Environmental Pollutants, Environmental Studies Board; Patrick L. Brezonik, associate professor of water chemistry, University of Florida, chairman; U.S. Environmental Protection Agency, sponsor.

Study of Jojoba Production System Potential. Committee on A Study of Jojoba Production Systems Potential, Board on Agriculture and Renewable Resources; Parker F. Pratt, professor of soil science, University of California, Riverside, chairman; Office of Native American Programs, U.S. Department of Health, Education, and Welfare, sponsor.

Pesticides

(continued from page 1)

present and interpret data in science panels and public hearings.

• Because government may, when necessary, make public trade secrets and other confidential information provided for regulatory reasons, many feel incentive for innovation is weakened. The problem is to assure the information necessary for purposes of regulation while protecting proprietary interests.

• The administrator of the Environmental Protection Agency may exempt emergency uses of pesticides from regulation by the Federal Environmental Pesticide Control Act of 1972. But because definitions of emergency conditions differ, there is need to consider the scientific basis for decisions as to when exemption provisions apply.

• Benefits and risks from use of a particular pesticide are assessed largely on the basis of estimates of economic loss from pests or pest-related disease. Because reliable estimates of health costs of pesticide use are scarce and difficult to express in dollars, there is need to ask how this information can be improved.

• As it becomes possible to measure smaller quantities of chemicals in foods, questions are raised regarding use of these measurements in regulatory action. How can Federal agencies use new data in setting permissible levels for pesticide residues?

As a way to derive general principles for use of scientific information in regulatory decision, the study committee will conduct case studies of major issues as part of its task.

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Ammonia: A Problem?

A COMMITTEE of the National Research Council Assembly of Life Sciences is taking a look at ammonia, an apparently innocuous atmospheric pollutant.

Like some other natural constituents of the atmosphere, ammonia appears hazardous only at high concentrations. Troublesome pockets of ammonia pollution do occur in cities, where ammonia can be released in the combustion of fuels and incineration of waste. But the major sources of ammonia in the atmosphere, and promising areas of inquiry, are such natural processes as the decomposition of organic matter and the release of ammonia from fertilizers.

The Committee on Medical and Biologic Effects of Environmental Pollutants was established in 1970 for just such studies. Funded by the Environmental Protection Agency, the work of the committee is to evaluate current knowledge of effects of each of a series of pollutants on public health and welfare and to indicate research needs relating to controls, safety margins, and possible dose-response relationships. Subjects of past studies include fluorides, lead, asbestos, manganese, nickel, and polycyclic organic matter.

Chairman of the Subcommittee on Ammonia is Henry Kamin, professor of biochemistry, of the Duke University Medical Center.

News Report

NATIONAL ACADEMY OF SCIENCES • NATIONAL ACADEMY OF ENGINEERING
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1975 News Report Index

Vol. XXV Nos. 1-6

News Report records the major activities of the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council. Six issues were published in 1975.

This index is intended insofar as possible to provide a digest of the contents of the 1975 issues of *News Report*. Because the publication is devoted in large measure to discussion of reports issued by committees and panels of these organizations, principal entries generally are listed by title of report discussed (not by title of *News Report* article), alphabetically. Names of persons, organizations, and agencies also are listed alphabetically. Subject headings and cross-references are included for topics of particularly wide interest (e.g., agriculture, energy, environment). The *News Report Index* is compiled by Gay Mackintosh.

The 1976 index will be issued early next year. Copies of the 1973 and 1974 indexes are available from the *News Report* office, National Academy of Sciences, 2101 Constitution Avenue N.W., Washington, D.C. 20418. Back volumes of *News Report* in microform can be ordered from Xerox University Microfilms, 300 North Zeeb Road, Ann Arbor, Mi. 48106.

Part II of two parts

New Publications*

**Documents marked with an asterisk (*) are available from the Printing & Publishing Office, National Academy of Sciences, 2101 Constitution Avenue N.W., Washington, D.C. 20418. Other documents are available from other sources as noted. For Transportation Research Board documents, write to the Transportation Research Board, National Research Council, 2101 Constitution Avenue N.W., Washington, D.C. 20418. For NTIS documents, write to the National Technical Information Service, Springfield, Va. 22161. Prices are subject to change.*

Compensation Formula for Hearing Loss. Report of Working Group 77—Compensation Formula for Hearing Loss; Committee on Hearing, Bioacoustics, and Biomechanics; Assembly of Behavioral and Social Sciences, National Research Council (Committee on Hearing, Bioacoustics, and Biomechanics, March 1975; 7 pp.; available from NTIS; AD/A-014 487; $3.25 paper, $2.25 microfiche).

***Conference on Electrical Insulation and Dielectric Phenomena: 1974 Annual Report.** Prepared by the Conference on Electrical Insulation and Dielectric Phenomena; Commission on Sociotechnical Systems, National Research Council (National Academy of Sciences, 1975; 706 pp.; ISBN 0-309-02416-1; $25.00).

Engineering Aspects of the Tornadoes of April 3-4, 1974. Prepared by Kishor C. Mehta, *et al.* for the Committee on Natural Disasters; Commission on Sociotechnical Systems, National Research Council (Committee on Natural Disasters, 1975; 110 pp.; limited number of copies available from the committee).

Incendiarism: An Overview and an Appraisal. Report on a Conference on Arson and Incendiarism, July 29-30, 1975, Washington, D.C. Committee on Fire Research; Commission on Sociotechnical Systems, National Research Council (Committee on Fire Research, 1975; 14 pp.; available from the committee).

Mechanical Rope and Cable (NMAB-306). Report of the Ad Hoc Committee on Mechanical Rope and Cable; National Materials Advisory Board; Commission on Sociotechnical Systems, National Research Council (National Materials Advisory Board, 1975; 105 pp.; available from NTIS; AD/A-013 345; $5.25 paper, $2.25 microfiche).

Noise and Children: A Review of Literature. Prepared by John H. Mills for Working Group 76, of the Committee on Hearing, Bioacoustics, and Biomechanics; Assembly of Behavioral and Social Sciences, National Research Council. *Journal of the Acoustical Society of America,* October 1975; reprints available from the committee.

Opportunities for Permafrost-Related Research Associated with the Trans-Alaska Pipeline System. Report of a workshop, March 19-22, 1975, Scottsdale, Az., Committee on Permafrost, Polar Research Board; Assembly of Mathematical and Physical Sciences, National Research Council (Polar Research Board, 1975; 37 pp.; available from the board).

***Problems of Drug Dependence: 1975.** Proceedings of the Thirty-Seventh Annual Scientific Meeting, Committee on Problems of Drug Dependence; Division of Medical Sciences, Assembly of Life Sciences, National Research Council, Washington, D.C., May 19-21, 1975 (National Academy of Sciences, 1975; 1212 pp.; ISBN 0-309-02417-X; $22.50).

Proceedings of a Symposium on Viral Hepatitis, National Academy of Sciences, Washington, D.C., March 17-19, 1975. Committee on Viral Hepatitis; Assembly of Life Sciences, National Research Council. *American Journal of the Medical Sciences,* July-August and September-October 1975; limited number of copies available from the committee.

Report of the Ad Hoc Panel on Forecasting Coal Technology. Ad Hoc Panel on Forecasting Coal Technology, Committee on Mineral Resources and the Environment; Commission on Natural Resources, National Research Council (Ad Hoc Panel on Forecasting Coal Technology, November 1, 1975; 27 pp.; available from the Committee on Mineral Resources and the Environment).

***Second Supplement to the Food Chemicals Codex, Second Edition (Second Supplement to F.C.C. [Food Chemicals Codex] II).** Subcommittee on Codex Specifications, Committee on Food Protection; Food and Nutrition Board; Division of Biological Sciences, Assembly of Life Sciences, National Research Council (National Academy of Sciences, 1975; 44 pp.).

Visual Elements in Flight Simulation. Report of Working Group 34 of the Committee on Vision; Assembly of Behavioral and Social Sciences, National Research Council (Committee on Vision, 1975; 70 pp.; limited number of copies available from the committee).

***World Food and Nutrition Study: Enhancement of Food Production for the United States.** Board on Agriculture and Renewable Resources; Commission on Natural Resources, National Research Council; prepared for the National Research Council Study on World Food and Nutrition (National Academy of Sciences, 1975; 187 pp.; ISBN 0-309-02435-8; $6.00).

***World Food and Nutrition Study: Interim Report** and **Recommended Actions on Nutrition Research and Development. World Food and Nutrition Study: Interim Report,** by the Steering Committee for the NRC [National Research Council] Study on World Food and Nutrition; Commission on International Relations, National Research Council; **Recommended Actions on Nutrition Research and Development,** report to the Steering Committee for the NRC Study on World Food and Nutrition, by the Food and Nutrition Board; Assembly of Life Sciences, National Research Council (National Academy of Sciences, 1975; 104 pp.; ISBN 0-309-02436; $5.50).

TRANSPORTATION RESEARCH BOARD

Bituminous Emulsions for Highway Pavements (National Cooperative Highway Research Program Synthesis of Highway Practice 30). Transportation Research Board; Commission on Sociotechnical Systems, National Research Council (Transportation Research Board, 1975; 76 pp.; ISBN 0-309-02337-8; $4.80).

Corrosion, Concrete, Quality Control, and Paint Beads (Transportation Research Record 539). Transportation Research Board; Commission on Sociotechnical Systems, National Research Council (Transportation Research Board, 1975; 112 pp.; ISBN 0-309-02390-4; $4.80).

Effect of Roadway Geometrics on Traffic Operations (Transportation Research Record 541). Transportation Research Board; Commission on Sociotechnical Systems, National Research Council (Transportation Research Board, 1975; 55 pp.; ISBN 0-309-02394-7; $2.60).

Frost, Moisture, and Erosion (Transportation Research Record 532). Transportation Research Board; Commission on Sociotechnical Systems, National Research Council (Transportation Research Board, 1975; 105 pp.; ISBN 0-309-02380-7; $4.60).

Motorist and Transit-User Services (Transportation Research Record 536). Transportation Research Board; Commission on Sociotechnical Systems, National Research Council (Transportation Research Board, 1975; 48 pp.; ISBN 0-309-02387-4; $2.40).

Pavement and Soil Characteristics (Transportation Research Record 537). Transportation Research Board; Commission on Sociotechnical Systems, National Research Council (Transportation Research Board, 1975; 81 pp.; ISBN 0-309-02388-2; $3.80).

Polymer Concrete (Transportation Research Record 542). Transportation Research Board; Commission on Sociotechnical Systems, National Research Council (Transportation Research Board, 1975; 66 pp.; ISBN 0-309-02395-5; $3.20).

Treatment of Soft Foundations for Highway Embankments (National Cooperative Highway Research Program Synthesis of Highway Practice 29). Transportation Research Board; Commission on Sociotechnical Systems, National Research Council (Transportation Research Board, 1975; 25 pp.; ISBN 0-309-02334-3; $3.20).

Urban Accident Patterns (Transportation Research Record 540). Transportation Research Board; Commission on Sociotechnical Systems, National Research Council (Transportation Research Board, 1975; 56 pp.; ISBN 0-309-02393-9; $2.60).

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NATIONAL ACADEMY OF SCIENCES
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Meetings, Special Announcements

The following schedule lists public meetings and includes other special announcements of units of the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council. The schedule is prepared early, and details are subject to change and should be checked directly with project offices as noted below. Any written submission should be sent directly to the listed unit at 2101 Constitution Avenue N.W., Washington, D.C. 20418.

Feb. 12, 1976 2 p.m.	National Academy of Sciences, Washington, D.C.	Steering Committee for the World Food and Nutrition Study, Commission on International Relations; study in response to President Ford's request for recommendations to apply U.S. research and development to alleviate world hunger and malnutrition; committee invites written statements by Jan. 29 as well as comments from the floor. For further information: B. B. West, 202/389-6855.
Mar. 3-5, 1976 8:30 a.m.	National Academy of Sciences, Washington, D.C.	Symposium on Statistics and the Environment, Committee on National Statistics and the Committee on Toxicology, in cooperation with the American Statistical Association and the American Society for Quality Control; meeting to promote interaction among statisticians, toxicologists, epidemiologists, and others in planning, conduct, and interpretation of environmental observations. $30 registration fee. For further information: M. L. Straf, 202/389-6997.
Mar. 15-17, 1976 9 a.m.	Sheraton-Park Hotel, Washington, D.C.	Sixth International Conference on Demand-Responsive Transit and Other Paratransit Services, Transportation Research Board; conference to provide information on existing demand-responsive transportation systems, means to initiate such services, and problem areas. For further information: M. Damon, 202/389-6335.
Mar 16, 1976 9 a.m.	National Academy of Sciences, Washington, D.C.	Academy Forum: Frontier Expansion or Inward Development, one of a Series of Forums in a Bicentennial Context. For further information: R. R. White, 202/389-6305.
Mar. 26, 1976 9 a.m.	National Academy of Sciences, Washington, D.C.	Safe Drinking Water Committee, Commission on Natural Resources; meeting to inform public of the progress of various subcommittees studying health effects of drinking-water contaminants. For further information: R. Housewright, 202/389-6747.
Aug. 30-Sept. 2 1976	Rome, Italy	VII International Congress on Photobiology. Applications for travel grants should be sent by March 15 to the U.S. National Committee for Photobiology, National Academy of Sciences, 2101 Constitution Ave. N.W., Washington, D.C. 20418. For further information and application forms: H. E. Sheppard, 202/389-6437.

Late Notices

Feb. 3, 1976 Feb. 5, 1976	San Francisco, Ca. Denver, Co.	Committee on Nuclear and Alternative Energy Systems, Assembly of Engineering; hearings to receive views on plan for and issues to be addressed by committee's study of current and likely states of energy technologies through year 2010, policy choices and likely consequences of each, and uncertainties regarding consequences, as well as energy demand, health and economic implications, and environmental considerations. For further information: M. H. Naftalin, 202/389-6243.
Feb. 9-10, 1976 9 a.m.	National Academy of Sciences, Washington, D.C.	Board on Engineering Manpower and Education Policy, Assembly of Engineering; Conference on Modeling and Simulation in Engineering Manpower Studies. For further information: J. P. Moore, 202/389-6675.
Feb. 17, 1976 9 a.m.	National Academy of Sciences, Washington, D.C.	Committee on Public Information in the Prevention of Occupational Cancer, Assembly of Life Sciences; meeting to receive views on character of program to be established--by Occupational Safety and Health Administration --to provide employers and employees with information on risks of cancer associated with particular forms of employment and on measures that may be taken to reduce those risks. For further information: H. S. Parker, 202/389-6393.

THE JOHNS HOPKINS UNIVERSITY · BALTIMORE, MARYLAND 21218

DEPARTMENT OF
SOCIAL RELATIONS

21 September 1971

Dr. E. E. David, Jr.
President's Science Advisor
Executive Office of the President
Washington, D.C. 20506

Dear Ed:

I am writing about two things: new members and new technology.

1. Possible new members that are neither social scientists nor physical scientists, but have a foot in both camps:

W. Allen Wallis, statistician, past chairman of statistics department at Chicago, present president of the University of Rochester.

Frederick Mosteller, statistician, Harvard University.

David Blackwell, statistician, Berkeley. (Blackwell is a Negro.)

Is John Tukey eliminated by his own choice?

John Kemeny, mathematician, president of Dartmouth.

Leo Goodman, statistician, University of Chicago.

2. Possible new social science members:

Otis Dudley Duncan, sociologist, University of Michigan, work in occupational mobility, quantitative research methods.

Nathan Keyfitz, demographer, Berkeley (may be a Canadian citizen).

George A. Miller, psychologist, Rockefeller University.

Ernest Hilgard, psychologist, Stanford.

Patrick Suppes, philosopher, psychologist, Stanford.

Paul Samuelson, economist (first Nobel prize winner in economics), MIT.

Jim Coleman

James S. Coleman

JSC/vrb

P.S. I just talked to Pat Moynihan, who had just talked to Herb Simon, about people they mentioned Anthony Downs and Robert Solow, both of whom I would strongly endorse. Downs was not on my above list, but I would strongly favor him. He, incidentally, has just finished a large study on strategies in school desegregation, for the Cabinet Committee on School Desegregation, at George Schmidt

DOWNS, DR. ANTHONY, b. Evanston, Ill, Nov. 21, 30; m. 56; c. 5. ECONOMICS, POLITICAL SCIENCE. B.A, Carleton Col, 52; Wilson fel, Stanford, 52-53, Rosenberg fel, 52-53, Earhart fel, 54-55, Off. Naval Res. fel. 55-56, M.A. & Ph.D.(econ), 56. Sr. analyst urban econ, REAL ESTATE RES. CORP, 59-60, dir. retail anal, 60-62, SR. V.PRES. URBAN PLANNING & ECON. STUDIES, 62- Asst. prof, Chicago, 59-61. Econ. consult, Rand Corp, 63-65; consult, City of Chicago, 64-; Econ. Develop. Admin, 65-; Dept. Housing & Urban Develop, 66-; Nat. Adv. Cmn. Civil Disorders, 67- Mem, Nat. Cmn. Urban Probs, 66-68. U.S.N.R, 56-59, Lt.(jg). Econ. Asn. Relation of politics to economic decision-making; theories of democratic decision-making and the public interest; urban and real estate economics; urban transportation economics; economics location theory. Publ: An economic theory of democracy; Inside bureaucracy, Little, 67; co-auth, A theory of large managerial firms, J. Polit. Econ, 66. Address: 39 Brinker Rd, Barrington, Ill. 60010.

SOLOW, PROF. ROBERT M(ERTON), b. Brooklyn, N.Y, Aug. 23, 24; m. 45; c. 3. ECONOMICS, STATISTICS. A.B, Harvard, 47, A.M, 49, Ph.D, 51; Soc. Sci. Res. Coun. fel, Columbia, 49-50; LL.D, Chicago, 67. Asst. prof. statist, MASS. INST. TECH, 50-54, assoc. prof, 54-58, PROF. ECON, 58- Fel, Center Adv. Study Behav. Sci, 57-58; sr. economist, Coun. Econ. Adv, 61; Ford Found. faculty res. fel, 63-64; Devries lectr, Rotterdam, 63; Marshall lectr, Cambridge, 63; Wicksell lectr, Stockholm, 64; Eastman prof, Oxford, 68-69. Econ. Asn.(John Bates Clark medal, 61); Econom. Soc.(pres, 64). Theory of economic growth; capital and interest theory. Publ: Capital theory and the rate of return, North Holland, 63; Nature and sources of unemployment in the U.S, Almquist & Wiksell, 64; Neoclassical growth with fixed factor proportions, Rev. Econ. Studies, 4/66. Address: Dept. of Economics, Massachusetts Institute of Technology, Cambridge, Mass. 02139.

NATIONAL ACADEMY OF SCIENCES

OFFICE OF THE PRESIDENT
2101 CONSTITUTION AVENUE
WASHINGTON, D. C. 20418

September 25, 1971

Dr. Edward E. David, Jr.
Science Adviser to the President
Executive Office Building
Washington, D. C. 20506

Dear Ed:

This note will serve to endorse the recommendation which Holly Smith has submitted for Dr. James B. Wyngaarden as a prospective member of PSAC.

I have known Dr. Wyngaarden for a period only slightly shorter than the acquaintanceship between Holly Smith and Wyngaarden. I first knew him as a postdoctoral fellow working in the laboratory of Dr. DeWitt Stetten, (presently the director of the National Institute of General Medical Sciences) in the Public Health Research Institute of the City of New York and later at the National Institutes of Health. It was I who invited Wyngaarden to come to Duke University for a post which only shortly thereafter I offered to Holly himself. For some five years he served as director, at Duke, of the Medical Sciences Research Training Program which I had created and then was launched upon his career on the Duke medical faculty.

There is no more solid citizen in the world of medicine than Jim. He is extremely firmly grounded in the scientific bases of medicine, is himself a sharp clinician, an excellent teacher and extraordinarily efficient manager. He succeeded Dr. Eugene A. Stead as chairman of the Duke University Department of Medicine, one of the richer plums in all of academic medicine in that the position carries great prestige and house officers in that department over the last twenty five years now occupy about one quarter of all the chairs in medicine in the United States.

Wyngaarden is an extraordinarily thorough man who will accept appointment to a given post or task only if he is completely convinced that he can meet the requirements thereof. He does his homework meticulously and it shows. This was particulary evident in the activities of the panel on medicine which was chaired by Ivan Bennett and to which Holly himself contributed so very much.

I do believe that in the years ahead there will be increasing reason for the membership of PSAC to include substantial competence in the medical world and no one individual more completely typifies the best of modern scientific medicine than does Wyngaarden.

Incidentally, Mrs. Ethel Wyngaarden is a devout, hardworking Republican. I know nothing of Jim's personal politics since these have not been visible in any form.

Sincerely,

Philip Handler
President

UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

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SCHOOL OF MEDICINE
DEPARTMENT OF MEDICINE

SAN FRANCISCO, CALIFORNIA 94122

August 9, 1971

Doctor Edward E. David, Jr.
Science Advisor to the President
The White House
Washington, D.C. 20500

Dear Ed:

I would like to bring to your attention the name of Doctor James B. Wyngaarden as a possible appointee to PSAC. I believe that his name was brought up once in the past in this connection.

Jim Wyngaarden is Chairman of the Department of Medicine at Duke University and formerly held the same position at the University of Pennsylvania. In addition to being one of the leaders in internal medicine in the country, he is fully qualified in biochemistry and is a member of the American Society for Biological Chemists. Jim has made outstanding contributions in the area of genetic and metabolic diseases. More important, he has established himself as one of the clearest thinkers in biomedical research and medical education in the country. He has worked on the previous biomedical panel under the Chairmanship of Ivan Bennett and was outstanding. He is now one of the most effective members of our current panel on Training for Research in the Biomedical Sciences. I have discussed this with Ivan, and he fully supports this proposal. Phil Handler knows him very well from their days together at Duke University and can give you confirmatory information concerning his abilities. Jim is approximately 47 years old and incidentally is a registered Republican. I do not know of anyone else in medicine who would be more highly qualified for such an appointment at this time.

Sincerely,

Holly

Lloyd H. Smith, Jr., M.D.
Professor of Medicine
Chairman, Department of Medicine

cc: Mr. David Beckler
Dr. John D. Baldeschwieler
Dr. Ivan L. Bennett, Jr.

SCIENCE ADVISORY COMMITTEE
EXECUTIVE OFFICE BUILDING
WASHINGTON, D.C. 20506

Mr. Buchsbaum
1 = PI
enc
9/21

September 22, 1971

MEMORANDUM FOR

Edward E. David, Jr.

You asked me to meet with Ivan Bennett and Phil Handler in order to arrive at suggestions for appointments to PSAC in the biomedical area. We had discussed this previously, but reviewed possible candidates once again on September 20th. We would like to suggest two candidates for your consideration, listed in preference sequence. It should be noted that Thomas was not replaced last year with a member in the general field of biology and that Wood will be retiring this year.

1) James B. Wyngaarden - He served very effectively on the Biomedical Panel under Ivan Bennett, and is now one of our most valuable members of the Panel on Training for Research in the Biomedical Sciences. In addition to being a physician, he has firm credentials as a biochemist. His curriculum vitae has been submitted already. We have reason to believe that he would be very interested in joining PSAC and that he would give the necessary time to be an effective member.

2) Harry Eagle (Albert Einstein School of Medicine) - Eagle can perhaps be best described as a cell biologist. Phil knows him much more intimately than I do and will submit his curriculum vitae and a supporting statement about his qualifications shortly.

I would like to note incidentally that Richard Nelson (Yale) has been very impressive in his contributions to the current Biomedical Panel as an economist.

L. H. Smith, Jr.

cc:
John D. Baldeschwieler
Ivan Bennett
Philip Handler
Herbert Simon

NATIONAL ACADEMY OF SCIENCES

OFFICE OF THE PRESIDENT
2101 CONSTITUTION AVENUE
WASHINGTON, D. C. 20418

September 25, 1971

Dr. Edward E. David, Jr.
Science Adviser to the President
Office of Science and Technology
Executive Office Building
Washington, D. C. 20506

Dear Ed:

This letter will supplement that from Holly Smith with respect to our nomination of Harry Eagle to be a member of PSAC. As his letter indicated Jim Wyngaarden is our primary nomination but if for some reason this is not acceptable it would be difficult to imagine a more suitable candidate than is Harry Eagle. At present, he is Professor of Cell Biology at the Albert Einstein School of Medicine. He has had a long career on the staff of the National Institutes of Health, within the Public Health Service proper and the faculty of Johns Hopkins University School of Medicine, in reverse order. In truth, Dr. Eagle has had not one but about three careers. A distinguished microbiologist then a distinguished immunologist he is today the dean of that school of endeavor which is called cell biology. Although his entire career has been characterized by research at the frontiers of fundamental biology, he also has had extensive clinical experience, broad knowledge of the problems of public health and was one of the leaders in organizing the program by which syphilis and gonorrhea are almost eradicated by the use of penicillin.

His particular competence to engage in the kinds of exercises familiar to PSAC can best be gauged by his service on COSPUP at the Academy. Perhaps it should suffice to say that when Eagle's term expired, Harvey Brooks did his best to have me reappoint Dr. Eagle despite our rather firm rule in this regard. Dr. Eagle is

invariably objective, dispassionate, and of a sharply critical but always constructive turn of mind. He rarely takes anything as necessarily given and, on COSPUP, invariably turned in incisive analyses of the problems under consideration and never failed to do his homework in any case. More recently also he served as chairman of the Life Sciences panel of the Space Science Board for the Academy. The report of his panel was so good that NASA wrote to indicate that they had accepted all of its major recommendations upon receipt of only a preliminary draft which had not yet undergone review by the full Board or by our Report Review Committee. A brief curriculum vitae is appended below.

Sincerely yours,

Phil

Philip Handler
President

Attachment

HARRY EAGLE

Born July 13, 1905, in New York, New York. A.B., Johns Hopkins University, 1923; M.D., 1927; M.S. (hon.), Yale University, 1948. From intern to instructor, Johns Hopkins University, 1927-32. Research fellow, Harvard Medical School, 1932-33. Associate in bacteriology to assistant professor, University of Pennsylvania, 1933-36. Commissioned officer of the U. S. Public Health Service in 1936: director, venereal disease research laboratory, Johns Hopkins University, 1936-46, director, laboratory of experimental therapeutics, 1946-48; scientific director, research branch, National Cancer Institute, National Institutes of Health, 1947-49; chief, section of experimental therapeutics, National Institute of Allergy & Infectious Diseases, 1949-59; chief, laboratory of cell biology, 1959-61. Professor and chairman, department of cell biology, Albert Einstein College of Medicine, Yeshiva University, 1961–. Recipient of Eli Lilly bronze medal, 1936; Alvarenga prize, College of Physicians, Philadelphia, 1936; Presidential Certificate of Merit, 1948.

Eagle has been a prolific worker whose fields of major interest have ranged widely. Despite this diversification and spreading into many fields, he has made very significant contributions in a number of them. His early work dealing with various immune reactions contributed solidly to our knowledge of their mechanisms. Later he studied the Wassermann reaction and succeeded in ascribing an explanation to some of its more emperic aspects. He worked out the nutritional requirements of the *Treponemata* and devised a defined medium for their cultivation. He studied the binding power of penicillin in relation to its cytoxic action and contributed to our better understanding of this antibiotic.

Eagle is probably best known for his recent very important studies of the growth requirements of cells in culture. In this field, he has been a pioneer in determining the specific amino acid and the minimum vitamin requirements of mammalian cells growing *in vitro*. He has further studied the nutritional requirements of such cells when infected with viruses. Much of the ease and dependability with which virologists use cultured lines of mammalian cells in their work nowadays is attributable to Eagle's earlier painstaking work in this field.

PRINCIPAL CONTRIBUTIONS TO SCIENCE BY HARRY EAGLE

Mechanism of hemolysis by complement. I. Complement fixation as an essential preliminary to hemolysis. (With George Brewer.) *Journ. Gen. Physiol. 7:* 845-862, 1929.

Specific agglutination and precipitation. I. The mechanism of the reactions. *Journ. Immunol. 18:* 393-417, 1930.

Studies in the serology of syphilis. I. The mechanism of the flocculation reactions. *Journ. Exp. Med. 52:* 717-738, 1930.

Studies in the serology of syphilis. II. The physical basis of the Wassermann reaction. *Journ. Exp. Med. 52:* 739-746, 1930.

Studies in the serology of syphilis. III. Explanation of the fortifying effect of cholesterin upon the antigen as used in the Wassermann and flocculation tests. *Journ. Exp. Med. 52:* 747-768, 1930.

Studies in the serology of syphilis. VIII. A new flocculation test for the serum diagnosis of syphilis. *Journ. Lab. Clin. Med. 17:* 787, 1932.

The effect of combination with diazo compounds on the immunological reactivity of antibodies. (With Dorothea E. Smith and Percy Vickers.) *Journ. Exp. Med. 63:* 617-643, 1936.

Some effects of formaldehyde on horse antipneumococcus serum and diphtheria antitoxin, and their significance for the theory of antigen-antibody aggregation. *Journ. Exp. Med. 67:* 495-514, 1938.

On the presence in syphilitic serum of antibodies to spirochetes, their relation to so-called Wassermann reagin, and their significance for the serodiagnosis of syphilis. (With Ralph B. Hogan.) *Journ. Exp. Med. 71:* 215-230, 1940.

The effect of multiple substituents on the toxicity and treponemicidal activity of phenylarsenoxides. (With Ralph B. Hogan, G. O. Doak, and Harry G. Steinman.) *Journ. Pharm. Exp. Therap. 74:* 210-216, 1942.

The spirocheticidal action of penicillin *in vitro* and its temperature coefficient. (With Arlyne D. Musselman.) *Journ. Exp. Med. 80:* 493-505, 1944.

The inactivation of penicillins, F, G, and K, and X by human and rabbit serum. *Journ. Exp. Med. 85:* 141-161, 1947.

The nutritional requirements of *Treponemata.* I. Arginine, acetic acid, sulfur-containing compounds, and serum albumin as essential growth-promoting factors for the Reiter treponeme. (With Harry G. Steinman.) *Journ. Bact. 56:* 163-176, 1948.

Nutritional requirements of *Treponemata.* II. Pantothenic acid, glutamine and phenylalanine as additional growth-promoting factors for the Reiter strain. (With Harry G. Steinman.) *Journ. Bact. 60:* 57-68, 1950.

The nutritional requirements of *Treponemata.* III. A defined medium for cultivation of the Reiter treponeme. (With Harry G. Steinman and Vance I. Oyama.) *Journ. Bact. 64:* 265-269, 1952.

The binding of penicillin in relation to its cytotoxic action. I. Correlation between the penicillin sensitivity and combining activity of intact bacteria and cell-free extracts. *Journ. Exp. Med. 99:* 207-226, 1954.

The binding of penicillin in relation to its cytotoxic action. II. The reactivity with penicillin of resistant variants of streptococci, pneumonococci, and staphylococci. *Journ. Exp. Med. 100:* 103-115, 1954.

The specific amino acid requirements of a mammalian cell (strain L) in tissue culture. *Journ. Biol. Chem. 214:* 839-952, 1955.

The specific amino acid requirements of a human carcinoma cell (strain HeLa) in tissue culture. *Journ. Exp. Med. 102:* 37-48, 1955.

The minimum vitamin requirements of the L and HeLa cells in tissue culture, the production of specific vitamin deficiencies, and their cure. *Journ. Exp. Med. 102:* 595-600, 1955.

The nutritional requirements for the propagation of poliomyelitis virus by the HeLa cell. (With Karl Habel.) *Journ. Exp. Med. 104:* 271-287, 1956.

The amino acid requirements of monkey kidney cells in first culture passage. (With Aaron E. Freeman and Mina Levy.) *Journ. Exp. Med. 107:* 643-651, 1958.

Cytoxicity in human cell cultures as a primary screen for the detection of anti-tumor agents. (With George E. Foley.) *Cancer Res. 18:* 1017-1025, 1958.

Glucose and glutamine in poliovirus production by HeLa cells. (With James E. Darnell, Jr.) *Virology 6:* 556-566, 1958.

The effect of cell population density on the amino acid requirements for poliovirus synthesis in HeLa cells. (With James E. Darnell, Jr. and Thomas K. Sawyer.) *Journ. Exp. Med. 110:* 445-450, 1959.

The utilization of proteins by cultured human cells. (With Karl A. Piez.) *Journ. Biol. Chem. 235:* 1095-1097, 1960.

International Business Machines Corporation

Thomas J. Watson Research Center
P. O. Box 218
Yorktown Heights, New York 10598
914/945-2555

October 4, 1971

Mr. David Z. Beckler
Office of Science and Technology
216 Executive Office Building
Washington, D. C. 20506

Dear Dave:

At the September PSAC Meeting, Ed David appointed me, Sol Buchsbaum, Pat Haggerty, and Ken Olsen to make nominations for the Physical-Sciences group of new PSAC members.

I have talked in person or by telephone with former PSAC members Gordon MacDonald, Murph Goldberger, Paul Doty, Frank Westheimer, and Harvey Brooks, and with Ken Olsen, Phil Handler, and Sol Buchsbaum. I shall not be able to talk with Pat Haggerty until this afternoon, so I hasten to send you my list so far.

I append the typical, brief biographies from American Men of Science, Who's Who, etc., arranged alphabetically following the list. However, I think that PSAC members who don't know these individuals personally can contribute most not by weighing the published autobiographies against one another but by considering how appropriate are the interests and backgrounds of the nominees for the direction which we wish PSAC to take. The list follows, together with my specific recommendations in each category.

Chemists

Ronald Breslow, Columbia University, does very interesting work in enzyme action. There is general agreement that he is an excellent scientist, but similar agreement that he would be useful for PSAC only if he focuses his energy and intelligence on PSAC problems.

Herbert Gutowsky, University of Illinois, a physical chemist working in nuclear magnetic resonance techniques. He is thoughtful and single-minded.

Jerrold Meinwald, Cornell University, has done striking work on the chemistry of the defense mechanisms of insects. Generally regarded very highly as a scientist and for PSAC.

Harrison Shull, University of Indiana, a physical chemist/quantum mechanician/computer type. Hard working, but perhaps not with the initiative that we need on PSAC.

In this group I prefer Meinwald and Breslow in that order.

Biochemists

Jack Buchanan, MIT, enzymologist, more chemically oriented than the other biochemists/molecular biologists on this list.

Robert Holley, Salk Institute, Nobel Prize in determining the structure of transfer RNA.

Donald Kennedy, Stanford University. Biologist. Does physiology of sense organs. Has produced innovative curriculum in human biology.

Eugene Kennedy, Harvard Medical School, works in transport proteins (cell membranes).

Joshua Lederberg, Stanford University, Nobel Prize winner in biology with a deep interest in problems of science and national policy, ranging from systems aspects of medical service to questions of biological and chemical warfare.

In this group, I prefer Lederberg and Holley.

Physicists

Harold Brown, President of Caltech, former Defense Department Director of Defense Research and Engineering, presently active member of the US delegation to SALT.

Robert Dicke, Princeton University, member of the NSB, still an active physicist, very ingenious and wise both in physics and in hardware programs.

Harold W. Lewis, University of California at Santa Barbara, until recently Chairman of the IDA Jason Division, Member

of the PSAC Air Traffic Control Panel and of the PSAC Anti-High Jacking Panel, with recent experience in both tactical and strategic military areas, as well as the intelligence field.

W. A. Nierenberg, Scripps Institute, La Jolla, formerly a molecular beam physicist, now Director of Scripps. Would serve as earth scientist for PSAC.

Norman Ramsey, Harvard, continues to do active research, head of URA (University Research Associates), with interests in atomic energy and nuclear power. His interests are so close to those of G. Tape that they might be considered as alternatives.

I believe that two of the PSAC vacancies should be filled from this group.

Engineering

Burton Brown, General Electric, member of PSAC military panels.

Ivan Getting, President of Aerospace Corporation.

Donald P. Ling, retiring from Bell Telephone Laboratories and Bell-Comm. An engineer for whom I have the greatest respect.

Jack Ruina, Professor of Electrical Engineering, at MIT; formerly Vice President of MIT in charge of government laboratories; Member, General Advisory Committee to the Arms Control and Disarmament Agency; formerly President of the Institute for Defense Analyses and previously employed in the Department of Defense. Conducted a well-known and highly regarded view of the NIH around 1965.

Marvin Gustavson, Lawrence Radiation Laboratory at Livermore. A physical chemist, Marv Gustavson has been concerned, among other things, with the protection of nuclear weapons and has served on PSAC Ground Warfare Panel.

In this group I prefer Jack Ruina and Ivan Getting.

Environment

Norton Nelson, Head of the Institute for Environmental Medicine of the NYU Medical Center. Is head of the OST Panel on Trace Hazaradous Substances.

James Whittenberger, Associate Dean, Department of Physical Health, and Physiology, Harvard University. Concerned with industrial and artificial environments.

Alex Hollander, retired for several years from Oak Ridge National Laboratory. Creator of the megamouse experiment. Interests now in chemical mutagens. (BIOGRAPHY NOT ENCLOSED.)

Larry Hinkle, Cornell Medical School.

I have no preference among these, but the feeling that we need more candidates. There is widespread sentiment for finding a younger G. Evelyn Hutchisson from Yale University.

General Comments

I think that balancing the Committee with respect to fields, to institutional and geographical distribution, age, etc., is far less important than to obtain individuals of demonstrated ability, integrity, forthrightness, and energy. I think that a PSAC member ought to expect to devote one-fourth of his time to PSAC concerns and that there are enough people fulfilling these conditions to allow a good selection to be made.

I think that we waste a valuable opportunity if we appoint an individual who in his term on the Committee does not do his utmost to achieve what he believes is right. Experience shows that opportunities arise rarely, and it is only by perceptiveness, energy, integrity, and courage that we can protect our national and the world against serious dangers and capitalize on opportunities which may arise.

For this reason I believe that PSAC members should put PSAC work and PSAC attendance above other governmental service, and

that this should be agreed between the Chairman and potential new members.

In regard to balancing of fields, we need to have people who will be active across fields. I think we should state convincingly what I believe to be true, that the marshaling of the very best technical talent can be achieved by the PSAC panel mechanism on questions which are identified by the members of the PSAC itself, and that the record of identification of important questions is in fact very good. Among these questions, I include insecticides and pesticides, population control, education, the cost of health care, etc., and I think that we ought to make a good case for not opening PSAC to becoming a kind of Noah's Ark.

I think that in judging the suitability of candidates for PSAC, one should consider courage, a skeptical but constructive view, an understanding of the importance of time, the ability to entertain two ideas at the same time and to judge between them, and a sense of self-importance. These personal qualities are often but not always reflected in an individual's record of accomplishments.

Sincerely yours,

R L Garwin

Richard L. Garwin

RLG:ac

enclosures

BRESLOW, PROF. R(ONALD), Box 566 Havemeyer Hall, Columbia University, New York, N.Y. ORGANIC CHEMISTRY. Elizabeth, N.J, Mar. 14, 31; m. 55. A.B, Harvard, 52, A.M, 54, Ph.D.(chem), 56. Nat. Res. Coun. fel, COLUMBIA, 55-56, instr. CHEM, 56-59, assoc. prof, 59-63, PROF, 63- Chem. Soc. Aromaticity and small ring compounds; biochemical model systems; reaction mechanisms.

RONALD CHARLES DAVID BRESLOW, Professor (b. 1931). A.B., 1952, A.M., 1954, Ph.D., 1955, Harvard Univ. NRC Fellow, 1955, Cambridge (England). *Organic Chemistry*. Aromaticity and antiaromaticity; biochemical model systems; interactions in small ring compounds: mechanisms of organic reactions.

*R. Breslow and P. Campbell, Selective Aromatic Substitution within a Cyclodextrin Mixed Complex, J. Am. Chem. Soc., *91*, 3085 (1969).

*R. Breslow and M.A. Winnik, Remote Oxidation of Unactivated Methylene Groups, J. Am. Chem. Soc., *91*, 3083 (1969).

*#R. Breslow, W.N. Washburn and R.G. Bergman, Detection of Cyclobutadienocyclopentadienyl Anion, J. Am. Chem. Soc., *91*, 196 (1969).

*#L.D. Kispert, J.S. Hyde, C. de Boer, D.J. LaFollette and R. Breslow, Combined Endor and Electron Paramagnetic Resonance Techniques in a Study of Some Low-Symmetry Triphenylmethyl Derivatives, J. Phys. Chem., *72*, 4276 (1968).

*R. Breslow and I. Katz, Relative Reactivities of *p*-Nitrophenyl Phosphate and Phosphorothioate toward Alkaline Phosphatase and in Aqueous Hydrolysis, J. Am. Chem. Soc., *90*, 7376 (1968).

R. Breslow, Small Antiaromatic Rings, Angew. Chemie, Intern. Ed., *7*, 565 (1968).

*#R. Breslow, L. Kaplan and D.J. LaFollette, Carbonium Ions with Multiple Neighboring Groups. II. Physical Studies, J. Am. Chem. Soc., *90*, 4056 (1968).

*#R. Breslow, S. Garratt, L. Kaplan and D.J. LaFollette, Carbonium Ions with Multiple Neighboring Groups. I. Synthesis, J. Am. Chem. Soc., *90*, 4051 (1968).

#R. Breslow and M. Douek, Antiaromatic Effects in Cyanocyclopropenyl Anions, J. Am. Chem. Soc., *90*, 2698 (1968).

R. Breslow, Antiaromatic Systems, Chem. in Britain, *4*, 100 (1968).

*R. Breslow, S.S. Olin and J.T. Groves, Oxidative Cyclization of Farnesyl Acetate by a Free Radical Path, Tetrahedron Lett., *15*, 1837 (1968).

*R. Breslow, R.H. Grubbs, R. Herber and S. Lippard, Studies of Iron Tricarbonyl Cyclooctatetraene Complexes, J. Am. Chem. Soc., *89*, 6864 (1967).

*R. Breslow, J.T. Groves and G.A. Ryan, Cyclopropenyl Cation, J. Am. Chem. Soc., *89*, 5048 (1967).

#R. Breslow, J. Brown and J.J. Gajewski, Antiaromaticity of Cyclopropenyl Anions, J. Am. Chem. Soc., *89*, 4383 (1967).

Douglas J. LaFollette, Intramolecular Solvation.

Robert B. Fairweather, Metal-catalyzed Reactions of Coordinated Substrates.

Stephen S. Olin, Free Radical Cyclization of Terpenes.

Robert H. Grubbs, I. Cyclobutadiene Derivatives. II. Studies of Cyclooctatetraene Iron Tricarbonyl Complexes.

Jon E. Malmin, Metal Chelates as Enzyme Models.

Gordon A. Ryan, Synthesis of Cyclopropenone.

GUTOWSKY, DR. H(ERBERT) S(ANDER), Dept. of Chemistry, University of Illinois, Urbana, Ill. PHYSICAL CHEMISTRY. Bridgman, Mich, Nov. 8, 19; m. 49; c. 3. A.B, Indiana, 40; M.S, California, 46; Ph.D.(phys. chem), Harvard, 49. Instr. chem, ILLINOIS, 48-51, asst. prof, 51-55, assoc. prof, 55-56, PROF. CHEM, 56-, head div. phys. chem, 56-62. Guggenheim fel, 54-55; vis. prof, California, 56; Walker Ames vis. prof, Washington (Seattle), 57. U.S.A, 41-45. Nat. Acad; fel. AAAS; Chem. Soc; fel. Phys. Soc; Faraday Soc. Molecular and solid state structure; nuclear magnetism; radio frequency spectroscopy.

MEINWALD, DR. JERROLD, b. New York, N.Y. Jan. 16, 27; m. 55; c. 2. ORGANIC CHEMISTRY. Ph.B, Chicago, 47, B.S, 48; A.M, Harvard, 50, Althouse fel, 51, Ph.D.(chem), 52. Du Pont fel, CORNELL, 52, instr, CHEM, 52-54, asst. prof, 54-58, assoc. prof, 58-62, PROF, 62- Fel, Sloan Found, 58; Guggenheim fel, 60-61; Louderman lectr, Washington (St. Louis), 64; four-col. lectr, Mt. Holyoke Col, Smith Col, Amherst Col. & Univ. Massachusetts, 65; summer, vis. prof, New Hampshire, 62. Consult, Schering Corp; Norwich Pharmacal Co; Allied Chem. Corp. U.S.N.R, 45-46. Am. Chem. Soc; Brit. Chem. Soc; Swiss. Chem. Soc. Problems of structure, synthesis and reaction mechanism from the field of natural products; synthesis and reactions of highly strained systems; molecular rearrangements; photochemistry; chemical defense mechanisms of arthropods; chemistry of pheromones. Address: Dept. of Chemistry, Cornell University, Ithaca, N.Y. 14850.

JERROLD MEINWALD, Professor (b. 1927). Ph.B., 1947, B.S., 1948, Univ. of Chicago; M.A., 1950, Ph.D., 1952, Harvard Univ. *Organic Chemistry*. Chemical defense mechanisms and chemical communication in arthropods; biosynthesis; chemistry of natural products; carbonium ion rearrangements; synthesis and reactions of highly strained molecules; organic photochemistry.

#J. Meinwald, Y. C. Meinwald and P. H. Mazzocchi, Sex Pheromones of the Queen Butterfly: Chemistry, Science, *164*, 1174 (1969).

*J. Meinwald and L. Hendry, Defense Mechanisms of Arthropods. XXV. Stereospecific Synthesis of an Allenic Sesquiterpenoid from the Grasshopper *Romalea Microptera*, Tetrahedron Lett., *21*, 1657 (1969).

#J. Meinwald, A. M. Chalmers, T. E. Pliske and T. Eisner, Identification and Synthesis of *trans*, *trans*-3,7-Dimethyl-2,6-decadien-1,10-dioic Acid, a Component of the Pheromonal Secretion of the Male Monarch Butterfly, Chem. Comm., *86* (1969).

#J. Meinwald, A. M. Chalmers, T. E. Pliske and T. Eisner, Pheromones. III. Identification of *trans,trans*-10-Hydroxy-3,7-Dimethyl-2,6-Decadienoic Acis as a Major Component in 'Hairpencil' Secretion of the Male Monarch Butterfly, Tetrahedron Lett., *47*, 4893 (1968).

#J. Meinwald, Y. C. Meinwald, A. M. Chalmers and T. Eisner, Dihydromatricaria Acid; Acetylenic Acid Secreted by Soldier Beetle, Science, *160*, 890 (1968).

*M. B. Robin, H. Basch, N. A. Kuebler, B. E. Kaplan and J. Meinwald, Assignments in the Ultraviolet Spectra of Olefins, J. Chem. Phys., *48*, 5037 (1968).

#J. Meinwald, K. Erickson, M. Hartshorn, Y. C. Meinwald and T. Eisner, Defensive Mechanisms of Arthropods. XXIII. An Allenic Sesquiterpenoid from the Grasshopper *Romalea Microptera*, Tetrahedron Lett., *25*, 2959 (1968).

*J. Meinwald and R. A. Chapman, The Solution Photochemistry of Some Bicyclic Ketones, J. Am. Chem. Soc., *90*, 3218 (1968).

G. M. Klein, J. P. Heotis and J. Meinwald, Hydrolytic Dimerization of Ethyl 5-Amino-2-Furoate, J. Org. Chem., *33*, 1105 (1968).

*J. Meinwald and F. Uno, The Synthesis of Bicyclo[2.1.1]hex-2-ene, J. Am. Chem. Soc., *90*, 800 (1968).

*#J. Meinwald, J. C. Shelton, G. L. Buchanan and A. Courtin, Highly Strained Bicyclic Systems. XII. Synthesis and Solvolysis of 1,5,5-Trimethylbicyclo[2.1.1]hex-2- yl *p*-Toluenesulfonate, J. Org. Chem., *33*, 99 (1968).

John W. Kobzina, Photosynthetic Reactions: Intramolecular Reactions of Acyclic Dienones.

Thomas N. Wheeler, Carbonium Ion Rearrangements of Conformationally Rigid Cyclobutanes.

Allen T. Hamner II, Photosynthetic Reactions: A Study of the Intramolecular Paterno-Buchi Reaction.

Fumio Uno, Studies on Highly Strained Hydrocarbons.

Douglas A. Seeley, Photochemistry of *o*Dialkenylbenzenes.

SHULL, DEAN HARRISON, b. Princeton, N.J, Aug. 17, 23; m. 48; div; m. 62; c. 5. PHYSICAL CHEMISTRY. A.B, Princeton, 43; Ph.D.(phys. chem), California, 48. Assoc. chemist, U.S. Naval Res. Lab, Wash, D.C, 43-45; Nat. Res. Coun. fel, Chicago, 48-49; assoc. scientist, Ames Lab, Atomic Energy Cmn, 49; asst. prof. phys. chem, Iowa State, 49-55; assoc. prof, INDIANA, 55-58, prof. CHEM, 58-61, RES. PROF, 61-, DEAN GRAD. SCH, 66-, dir. res. comput. center, 59-63, acting chmn. chem. dept. & acting dean, 65-66. Guggenheim found. fel, 54-55; Sloan res. fel, 56-58; asst. dir. res, Quantum Chem. Group, Sweden, 58-59. Mem. subcmt. molecular struct. & spectros, Nat. Res. Coun, 57-63, chmn, 58-63, mem. cmt. phys. chem, 63-66, cmt. awards under Fulbright-Hayes Act, div. chem. & chem. tech, 59-, chmn, 63-, mem. panel surv. chem, Westheimer Cmt, 64-65, mem. adv. panel chem, Nat. Sci. Found, 64-67, chmn, 66-67, consult, Off. Sci. Info. Serv, 65- U.S.N.R, 45. AAAS; fel. Phys. Soc; Faraday Soc; Chem. Soc; Asn. Comput. Mach. Quantum chemistry; theoretical and experimental molecular spectroscopy and structure. Address: Dept. of Chemistry, Indiana University, Bloomington, Ind. 47401.

HARRISON SHULL, Professor (b. 1923). A.B., 1943, Princeton Univ.; Ph.D., 1948, Univ. of California, (Berkeley). Physical Chemistry. Quantum mechanics; theoretical chemistry; application of electronic computers to molecular problems of chemical interest; molecular potential functions and intermolecular interactions.

#C. F. Bunge, Electronic Wave Functions for Atoms. I. Ground State of Be, Phys. Rev., *168*, 92 (1968).

*R. E. Brown and H. Shull, A Configuration-Interaction Study of the Four Lowest $^1\Sigma^4$ States of the LiH Molecule, Intern. J. Quantum Chem. II, 663 (1968).

#J. F. Harrison, Electric-Dipole Polarizability of H_2O and NH_3, J. Chem. Phys., *49*, 3321 (1968).

*A. Macias, Configuration-Interaction Study of the H_3-System. II. Expanded Basis, J. Chem. Phys., *49*, 2198 (1968).

#J. F. Harrison, Nuclear Quadrupole Coupling Constants in Polyatomic Molecules, J. Chem. Phys., *48*, 2379 (1968).

*H. S. Kiang, Natural Expansion of Many-Electron Wave Function, Phys. Rev., *167*, 116 (1968).

#R. E. Christoffersen and H. Shull, Nature of the Two-Electron Chemical Bond. VII., J. Chem. Phys., *48*, 1790 (1968).

#R. Ferreira, Electronegativity and Chemical Bonding, Adv. Chem. Phys., *13*, 55 (1967).

#J. F. Harrison, Some One-Electron Properties of H_2O and NH_3, J. Chem. Phys., *47*, 2990 (1967).

*C. S. Lin, "Vectal" Representation of the Wave Function and Its Physical Meaning, Can. J. Phys., *45*, 3667 (1967).

*C. S. Lin, Some Remarks on the Linear Dependence Problem in Variational Calculations, Theor. Chem. Acta, *8*, 73 (1967).

BIOCHEMISTS

BUCHANAN, DR. JOHN M(ACHLIN), Dept. of Biology, Massachusetts Institute Technology, Cambridge 39, Mass. BIOCHEMISTRY. Winamac, Ind, Sept. 29, 17; m. 48; c. 4. A.B, DePauw, 38; M.S, Michigan, 39; Ph.D.(biochem), Harvard, 43; hon. D.Sc, Michigan, 61. Fel, Harvard Med. Sch, 39-43; instr. BIOL. CHEM, Pennsylvania, 43-46, asst. prof, 46-, assoc. prof, 49-50, prof, 50-53; PROF. & HEAD DIV, MASS. INST. TECH, 53- Nat. Res. fel, Nobel Inst, Stockholm, 46-48, mem. fel. cmt, Div. Med. Sci, Nat. Res. Coun, subcmt, nomenclature biochem, 60-66; mem. Nat. Cmt, Int. Union of Biochemist, 57-60, secy-treas, 63-66; lectr, Harvey Soc, 58. Civilian with Nat. Defense Res. Cmt, 43. Nat. Acad; Soc. Biol. Chem; Chem. Soc; Am. Acad.(Eli Lilly award, 51). Synthesis of glycogen; oxidation of fatty acids and ketone bodies; synthesis of purines; isolation and purification of enzymes.

HOLLEY, DR. ROBERT W(ILLIAM), b. Urbana, Ill, Jan. 28, 22; m. 45; c. 1. BIOCHEMISTRY. A.B, Illinois, 42; Ph.D.(org. chem), Cornell, 47. Asst. chem, Cornell, 42-44, res. chemist, med. col, 44-46, Nat. Res. Coun. fel, 46-47; Am. Chem. Soc. fel, State Col. Wash, 47-48; asst. prof. org. chem, N.Y. Exp. Sta, CORNELL, 48-50, assoc. prof, 50-57, res. chemist, U.S. Plant, Soil & Nutrit. Lab, 57-64, PROF. BIOCHEM, UNIV, 64- Guggenheim fel, Calif. Inst. Tech, 55-56; mem. biochem. study sect, Nat. Insts. Health, 62-66. Lasker award, 65. Civilian with Off. Sci. Res. & Develop, 44-45. AAAS; Chem. Soc; Soc. Biol. Chem. Protein biosynthesis; nucleic acids. Address: Dept. of Biochemistry, Cornell University, Ithaca, N.Y. 14850.

HOLLEY, DR. ROBERT W(ILLIAM). Biochemistry. See H-K Vol. & Suppl. IV to 11th ed, Phys. & Biol. Vols. New information: On leave from Cornell, resident fel, Salk Inst. Biol. Studies, 68- Nobel Prize in med, 68. Address: P.O. Box 1809, San Diego, Calif. 92112.

KENNEDY, PROF. DONALD, b. New York, N.Y, Aug. 18, 31; m. 53; c. 3. PHYSIOLOGY, ZOOLOGY. A.B, Harvard, 52, A.M, 54, Nat. Sci. Found. fel. & Ph.D, 56. Asst. prof. ZOOL, Syracuse, 56-59, assoc. prof, 59-60; asst. prof, STANFORD, 60-62, assoc, 62-65, PROF, 65- Soc. Zool; Soc. Gen. Physiol; Physiol. Soc. Comparative physiology of sense organs, especially visual systems; central nervous system of Crustacea. Address: Dept. of Biological Sciences, Stanford University, Stanford, Calif. 94305.

KENNEDY, DR. EUGENE P, b. Chicago, Ill, Sept. 4, 19; m; c. 3. BIOCHEMISTRY. Ph.D.(biochem), Chicago, 49; hon. M.A, Harvard, 60. Am. Cancer Soc. fel, California, 49-50; asst. prof, dept. biochem. & Ben May Lab, Chicago, 51-55, assoc. prof, 55-56, prof, 56-60; HAMILTON KUHN PROF. BIOL. CHEM, HARVARD MED. SCH, 60- Fel, Nat. Sci. Found, 59-60. Nat. Acad; Am. Acad; Chem. Soc.(res. award, 55; Paul-Lewis award, 58); Soc. Biol. Chem. Metabolism and function of lipids; membrane function; phosphoproteins; mechanism of enzyme action. Address: Dept. of Biological Chemistry, Harvard Medical School, Boston, Mass. 02115.

LEDERBERG, PROF. JOSHUA, b. N.J, May 23, 25. GENETICS. B.A, Columbia, 44; Ph.D.(microbiol), Yale, 47, Sc.D, 60. Asst. prof. genetics, Wisconsin, 47-50, assoc. prof, 50-54, prof, 54-58, prof. med. & genetics & chmn. dept, 58-59; PROF. GENETICS & BIOL. & EXEC. HEAD DEPT. GENETICS, MED. SCH, STANFORD, 59-, DIR. KENNEDY LABS MOLECULAR MED, 62- U.S.N.R, 43-45. Genetics and evolution. Address: Dept. of Genetics, Stanford University School of Medicine, Palo Alto, Calif. 94304.

PHYSICISTS

BROWN, DR. HAROLD, Office of the Secretary of Defense, Washington, D.C. PHYSICS. New York, N.Y, Sept. 19, 27; m. 53; c. 2. A.B, Columbia, 45, M.A, 46, Lydig fel, 48-49, Ph.D.(physics), 49; hon. D.E, Stevens Inst. Tech, 64. Lectr. physics, Stevens Inst. Tech, 49-50; physicist, Lawrence Radiation Lab, California, Berkeley, 50-52, mem. staff, Livermore, 52-53, group leader, 53-55, div. leader, 55-58, assoc. dir, 58-59, dep. dir, 59-60, dir, 60-61; DIR. DEFENSE RES. & ENG, OFF. SECY. DEFENSE, 61- Lectr. & mem. sci. staff, Columbia, 47-50. Adv. U.S. Del. Conference experts Detection Nuclear Weapons Tests, Geneva, 58; sci. adv, U.S. Del. Conf. Discontinuance Nuclear Weapons Tests, 58, sr. sci. adv, 58-59; consult, Dept. State, 58-60, panel consult, President's Sci. Adv. Cmt, 58-60; consult, sci. adv. bd, U.S. Air Force, 58-61. Mem, Polaris Steering Cmt, 56-58; sci. adv. cmt. ballistic missiles, Secy. Defense, 58-61; President's Sci. Adv. Cmt, 61. Distinguished Civilian Serv. award, U.S. Navy, 61; Columbia Univ. medal, 63. Phys. Soc. Nuclear and neutron physics; nuclear explosives and reactor design; weapons systems.

DICKE, DR. ROBERT H(ENRY), Dept. of Physics, Princeton University, Princeton, N.J. PARTICLE PHYSICS. St. Louis, Mo, May 6, 16; m. 42; c. 3. A.B, Princeton, 39; Ph.D.(physics), Rochester, 41. Staff mem. radiation lab, Mass. Inst. Tech, 41-46; asst. prof. PHYSICS, PRINCETON, 46-47, assoc. prof, 47-55, PROF, 55- Fulbright fel, 63. With Off. Sci. Res. & Develop, 44. Fel. Phys. Soc; fel. Geophys. Union; fel. Am. Acad. Gravitation; relativity; geophysics; astrophysics.

LEWIS, PROF. H(AROLD) W(ARREN), b. New York, N.Y, Oct. 1, 23; m. 47. PHYSICS. A.B, N.Y. Univ, 43; A.M, California, 44, Ph.D.(physics), 48. Asst. prof. physics, California, 48-53; mem. tech. staff, Bell Tel. Labs, N.J, 51-56; assoc. prof. PHYSICS, Wisconsin, 56-57, PROF, 57-64; CALIFORNIA, SANTA BARBARA, 64- Mem. staff, Inst. Adv. Study, 47-48, 50-51. U.S.N.R, 44-46. Phys. Soc. Theoretical physics. Address: Dept. of Physics, University of California, Santa Barbara, Calif. 93106.

NIERENBERG, PROF. WILLIAM A(ARON), b. New York, N.Y, Feb. 13, 19; m. 41; c. 2. PHYSICS. B.S, City Col. New York, 39; M.A, Columbia, 42, Ph.D.(physics), 47. Tutor physics, City Col. New York, 39-41; res. scientist, Manhattan Proj, 41-45; instr. physics, Columbia, 46-48; asst. prof, Michigan, 48-50; assoc. prof, CALIFORNIA, Berkeley, 50-56, prof, 56-65; DIR. SCRIPPS INST, 65- Dir, Hudson labs, Columbia, 53-54; prof, Miller Inst. Basic Res. Sci, 57-59; asst. secy. gen. sci, NATO, 60. Consult, U.S. Navy, 47; Lockheed Aircraft Corp, 57-; cmt. nuclear constants, Nat. Res. Coun, 58-; Nat. Security Agency, 58-; President's Spec. Projs. Cmt, 58- Mem. mine adv. cmt, Nat. Res. Coun, 54- Fel. Phys. Soc; Am. Acad; Geophys. Union. Gas diffusion; molecular and atomic beams; nuclear moments. Address: Scripps Institution of Oceanography, University of California, San Diego, La Jolla, Calif. 92038.

RAMSEY, PROF. NORMAN F(OSTER), JR, b. Washington, D.C, Aug. 27, 15; m. 40; c. 4. PHYSICS. A.B, Columbia, 35, Tyndall fel, 39, Ph.D.(physics), 40; Kellett fel, Cambridge, 35-37, M.A, 41, D.Sc, 54; hon. M.A, Harvard, 47. Fel, Carnegie Inst. Dept. Terrestrial Magnetism, 39-40; assoc. PHYSICS, Illinois, 40-42; assoc. prof, Columbia, 42-47; HARVARD, 47-50, prof, 50-66, HIGGINS PROF, 66-, dir, nuclear lab, 48-50, 52. Res. assoc, radiation lab, Mass. Inst. Tech, 40-42; group leader & assoc. div. head, atomic energy proj. lab, Los Alamos Sci. Lab, California, 43-45; head physics dept, Brookhaven Nat. Lab, 46-47; Guggenheim fel, 54-55. Dir, Varian Assocs. Consult, Off. Sci. Res. & Develop. & Nat. Defense Res. Cmt, 40-45; U.S. Secy. War, 42-45. Trustee, Brookhaven Nat. Lab, 52-56; Carnegie Endowment Int. Peace; Univ. Regs. Asn. Mem, sci. adv. bd, U.S. Dept. Air Force, 49-56; U.S. Dept. Defense, 54-58; sci. adv, NATO, 58-59; mem. gen. adv. cmt, Atomic Energy Cmn, 60-; chmn, high energy physics panel, Sci. Adv. Bd, Off. of the President, 63. Lawrence award & medal, 60. Civilian with U.S.A.A.F; U.S.N, 44. Nat. Acad. Sci; AAAS; fel. Phys. Soc; Philos. Soc; Math. Soc. Nuclear moments; molecular beams; high energy particles; nuclear interactions in molecules; deuteron quadrupole moment; molecular structure; diamagnetism; thermodynamics; proton-proton scattering; billion volt accelerators; atomic masers; electron scattering. Address: Dept. of Physics; Harvard University, Cambridge, Mass. 02138.

ENGINEERING

BROWN, BURTON P. (SM'60-F'67), Sr. Consulting Engr. GE, Heavy Military Elec. Dept., Court St. Plant, Syracuse N. Y. 13208.

GETTING, DR. I(VAN) A(LEXANDER), 605 Tigertail Rd, Los Angeles, Calif. PHYSICS. New York, N.Y, Jan. 18, 12; m. 37; c. 3. B.S, Mass. Inst. Tech, 33; Rhodes scholar, Oxford, 33-35, D.Phil.(astrophys), 35; hon. D.Sc, Northeastern, 54. Jr. fel, Harvard, 35-40; mem. radiation lab, Mass. Inst. Tech, 40-45, assoc. prof. elec. eng, 43-47, prof, 47-50; asst. develop. planning, deputy chief staff develop, U.S. Air Force, 50-51; v.pres. eng. & res, Raytheon Mfg. Co, 51-60; PRES, AEROSPACE CORP, 60- Mem, sci. adv. bd, U.S. Air Force, 45-; mem, Res. & Develop. Adv. Coun, Sig. Corps, 52-60; mem. undersea warfare cmn, Nat. Acad. Sci. Presidential Medal for Merit, 48; Naval Ord. Develop. award; Air Force exceptional serv. award, 60. Civilian with Off. Sci. Res. & Develop; sect. chief, Naval Fire Control, Nat. Defense Res. Cmt, 43-45; spec. consult. to secy. War, 43-45. AAAS; fel. Phys. Soc; fel. Inst. Elec. & Electronics Eng; fel. Am. Acad; sr. mem. Inst. Aeronaut. & Astronaut. Particle accelerators; nuclear physics; radar; fire control; gaseous discharges; astrophysics; multivibrator synchronization for accurate timing of long intervals; automatic tracking of targets by radar; rapid scanning radar antennas.

LING, DR. DONALD P(ERCY), b. Albany, N.Y, Jan. 2, 12; m. 40; c. 1. MATHEMATICS. B.A, Amherst Col, 33; Cambridge, 33-34; M.A, Columbia, 38, Ph.D.(math), 44. Instr. math, Phillips Acad, Andover, 35-37; instr. math, Columbia, 40-44, mathematician, appl. math. group, Nat. Defense Res. Cmt, 44-45; res. mathematician, BELL TEL. LABS, INC, 45-58, dir. mil. anal, 58-61, EXEC. DIR. MIL. SYSTS. RES. DIV, 61- Math Soc. Pure mathematics; guidance techniques; systems analysis; space technology. Address: Bell Telephone Labs, Inc, Whippany, N.Y. 07981.

RUDA, PROF. J(ACK) P(HILIP), b. Rypin, Poland, Aug. 19, 23; nat; m. 47; c. 3. ELECTRICAL ENGINEERING. B.S, City Col, 44; Microwave Res. Inst. fel, Polytech. Inst. Brooklyn, 48-50, M.E.E, 49, D.E.E, 51. Instr. elec. eng, Brown, 50-51, asst. prof, 51-52, assoc. prof, 52-54; res. assoc. prof, control systems lab, Illinois, 54-59, res. prof, coord. sci. lab. & prof. elec. eng, 59-63; PROF. ELEC. ENG, MASS. INST. TECH, 63-, V.PRES. SPEC. LABS. 66- Dep. for res. to Asst. Secy. Res. & Eng, U.S.Air Force, 59-63; asst. dir. defense res. & eng, Off. Secy. Defense, 60-61, dir. adv. res. projs. agency, U.S. Dept. Defense, 61-63; pres, Inst. Defense Anal, 64-66. Mem. Int. Sci. Radio Union. Consult, Exec. Off. Sci. & Tech; Dept of Defense; U.S. Air Force Sci. Adv. Bd; Arms Control Disarmament Agency; Dept. Health, Ed. & Welfare. Fleming award, 62; Secy. Defense meritorious civilian serv. award, 63. U.S.A, 45-46. AAAS; fel. Inst. Elec. & Electronics Eng; Inst. Aeronaut. & Astronaut; Inst. Strategic Studies. Statistical theory of noise; radar systems. Address: 28 Hawthorn St, Cambridge, Mass. 02138.

GUSTAVSON, DR. M(ARVIN) R(ONALD), P.O. Box 808, Lawrence Radiation Lab, Livermore, Calif. PHYSICAL CHEMISTRY. Chicago, Ill, Nov. 4, 27; m. 53; c. 2. B.S, Carnegie Inst. Tech, 48; Ph.D.(phys. chem), Cornell, 53. Chemist, Shell Develop. Co, 53-57; div. mgr, Aerojet-Gen. Nucleonics Div, Gen. Tire & Rubber Co, 57-60; v.pres. & gen. mgr, Ordtech Corp, 60-61; DIR. X DIV, LAWRENCE RADIATION LAB, 61- Spec. lectr, univ. & exten, California, 54-58; consult, govt. & indust. orgns, 60- Chem. Soc. Reaction kinetics; petrochemistry; nuclear reactor design and application; radiation chemistry; nuclear and non-nuclear weapon system design and evaluation; command and control; research organization and administration.

ENVIRONMENT

NELSON, DR. NORTON, b. McClure, Ohio, Feb. 6, 10; m. 36; c. 3. ENVIRONMENTAL MEDICINE, BIOCHEMISTRY. A.B, Wittenberg Col, 32, hon. D.Sc, 64; Chicago, 33; Ph.D.(biochem), Cincinnati, 38. Asst, Children's Hosp. Res. Found, Ohio, 34-38; instr, Cincinnati, 38-45, asst. prof, 46-47; assoc. prof. environ. med, med. center, N.Y. UNIV, 47-53, prof, 53-66, chmn. dept, 55-66, dir. inst. environ. med, 54-66, acting dir. Univ. Valley in Sterling Forest, 62-66, PROVOST, UNIV. HEIGHTS CENTER, 66- Biochemist, May Inst. Med. Res. Ohio, 38-42; res. assoc, Children's Hosp. Res. Found, 46-47; regent's lectr, California, 63. Trustee, Found. Adv. Ed. Sci. Mem. cmn. environ. hyg, Armed Forces Epidemiol. Bd, 60-66; study group smoking & health, Am. Cancer Soc-Am. Heart Asn-Nat. Cancer Inst-Nat. Heart Inst; med. & sci. adv. bd, Will Rogers Mem. Fund; Int. Cmn. Occup. Health; former chmn. cmt. toxicol. & former mem. cmt. atmospheric & indust. hyg, mem. man in space cmt, 61, space sci. summer study, Iowa, 62, working group, Gemini-Apollo manned orbiting lab. exp, 64 & space res. summer study, 65, Nat. Acad. Sci-Nat. Res. Coun; mem. expert panel carcinogenicity, Int. Union Against Cancer, 62; mem. panel air pollution, Gross cmt. air pollution, Dept. Health, Ed. & Welfare, 61, nat. adv. environ. health cmt, 63-67 & former mem. nat. adv. cmt. community air pollution to Surgeon Gen; mem. environ. sci. & eng. study sect, Nat. Insts. Health; panel non-neoplastic disease, Surgeon General's Adv. Cmt. Smoking & Health, U.S. Pub. Health Serv, 63; mem. adv. cmt. res. etiol. cancer, Am. Cancer Soc, 62, chmn, 64-65. Dir. chem. sect, Armed Forces Med. Res. Lab, Ky, Sanit.C, U.S.A, 42-46. AAAS; Air Pollution Control Asn; Chem. Soc; Indust. Hyg. Asn.(secy, 54-57); Pub. Health Asn; Soc. Pharmacol; Soc. Biol. Chem; Harvey Soc; Soc. Exp. Biol. Carcinogenesis; toxicology; physiology of fluids and electrolytes; carbohydrate and fat metabolism. Address: New York University, University Heights Center, New York, N.Y. 10453.

WHITTENBERGER, DR. JAMES L(AVERRE), b. Dahlnda, Ill, Feb. 12, 14; m. 43; c. 3. PHYSIOLOGY. S.B, Chicago, 37, M.D, 38; hon. A.M, Harvard, 51. Intern, Cincinnati Gen. Hosp, 38-39; Smith fel. surg, Chicago, 39-40; asst. res, Thorndike Mem. Lab, Boston City Hosp, 40-42, house physician, 4th med. serv, hosp, 42-43; Commonwealth Fund fel. med. & physiol, sch. med, N.Y. Univ, 43; assoc. PHYSIOL, SCH. PUB. HEALTH, HARVARD, 46-47, asst. prof, 47-49, assoc. prof, 49-50, PROF, 51-, HEAD DEPT, 48-, JAMES STEVENS SIMMONS PROF. PUB. HEALTH, 58-, ASSOC. DEAN, 66-, res. fel. med, med. sch, 40-42, asst. dean, 55-66. Asst, Peter Bent Brigham Hosp, 46-Consult, Children's Hosp, 48- Med.C, 43-46, Capt. AAAS; Physiol. Soc; Soc. Clin. Invest; Pub. Health Asn; Indust. Hyg. Asn. Respiratory physiology; occupational medicine; environmental health. Address: Harvard University School of Public Health, 55 Shattuck St, Boston, Mass. 02115.

HINKLE, DR. LAWRENCE E(ARLE), JR, b. Raleigh, N.C, Feb. 7, 18; m. 42; c. 6. INTERNAL MEDICINE. A.B, North Carolina, 38; M.D, Harvard, 42. Intern, Peter Bent Brigham Hosp, Boston, Mass, 42-43; asst. res. internal med, New York, Hosp, 46-48, provisional attend. physician, outpatient dept, 48-50; instr. med, MED. COL, CORNELL, 50-51, asst. prof. clin. med, 51-56, assoc. prof, 56-61, clin. assoc. prof. MED, 61-64, ASSOC. PROF, 64-Commonwealth fel, New York Hosp, 48-50, asst. physician, out-patient dept, 50-51, physician, 51-58, asst. attend. physician, 58-64, assoc. attend. physician, 64-; assoc. dir. human ecol. study prog, Cornell Med. Col, 56-64, dir, 64- Dipl, Am. Bd. Internal Med, 53. Med.C, 43-46, Lt. Psychosomat. Soc. (pres-elect, 65); Harvey Soc; Am. Med. Asn; Diabetes Asn; Indust. Med. Asn; Fedn. Clin. Research (secy-treas, 52-54, v.pres, 55, pres, 56), Diabetes mellitus; stress and disease; human ecology. Address: New York Hospital, 525 E. 68th St, New York, N.Y. 10021.

OTHER SUGGESTIONS FOR PSAC MEMBERSHIP

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY
WASHINGTON, D.C. 20506

September 22, 1971

MEMORANDUM FOR

Dave Beckler

Subject: PSAC Membership

Dick Balzhiser would like to recommend Prof. E. Huckey as a potential PSAC member. Huckey is from the Department of Metallurgical Engineering at the University of Michigan.

John D. Baldeschwieler
Deputy Director

EXECUTIVE OFFICE OF THE PRESIDENT

OFFICE OF SCIENCE AND TECHNOLOGY

WASHINGTON, D.C. 20506

September 21, 1971

MEMORANDUM FOR

Dr. David

SUBJECT: Proposed PSAC Candidate: Harold W. Lewis

As I understand you are willing to receive from the OST staff proposed PSAC candidates, I suggest for consideration Professor Harold W. Lewis of the University of California, Santa Barbara.

Professor Lewis is a theoretical physicist who has been associated with federal R&D for more than ten years. He has been a member of IDA/ JASON since its inception in 1960 and its Chairman since 1966. As a measure of his capabilities, his choice as Chairman was determined by his associates in JASON -- Gordon MacDonald, Murph Goldberger, Murray Gell-Mann, Ken Watson -- and concurred in by IDA's president at the time -- Maxwell Taylor. In my view, his performance in JASON demonstrates his intellectual leadership capabilities and that he is a peer of other JASON and PSAC members: Messrs Branscomb, MacDonald, Gell-Mann, Garwin, Goldberger.

In the course of his JASON work which has been heavily defense-oriented, he has become familiar with both the relevant technological issues of strategic and tactical systems, appreciates the subtleties of the interactions of weapons systems and the political realities in which progress is made. Concurrent with his chairmanship of JASON, he has been a member of the Air Force Science Advisory Board, the DCPG Science Advisory Committee and the PSAC Air Traffic Control Panel.

In addition to his defense interests, it was under Lewis' chairmanship of JASON that that group branched into civil R&D work. Since about 1967 JASON has been working on a contract with DOT which he and I

were instrumental in obtaining. That contract gave a broad charter, of which ATC was but the first task. Similar efforts were carried on with HUD -- in the housing area as I recall. Recently, as you know, he has been responsible for the study of civil applications of lasers for this Office.

In addition to his defense and civil interests, Lewis has had a close association with the Intelligence community for about 5 or 6 years. He has worked on R&D problems for the CIA Office of R&D and was a member of Gene Fubini's photographic panel during 1970.

John Martin

John Martin

Copy to
Mr. Beckler

DEPARTMENT OF STATE

Washington, D.C. 20520

BUREAU OF INTERNATIONAL SCIENTIFIC
AND TECHNOLOGICAL AFFAIRS

September 27, 1971

Dear Norm:

Per your telephone inquiry, we have thought about names to suggest for the upcoming vacancies on PSAC. A brief list with some pertinent biographical data is enclosed.

As may be evident, all five names are of individuals prominent in engineering, rather than pure research. It is our feeling that with so much governmental attention on technology matters, PSAC would be strengthened by more emphasis in this area.

Sincerely,

Herman Pollack

Herman Pollack
Director

Enclosure

Dr. Norman P. Neureiter,
Office of Science and Technology,
Executive Office Building,
Washington, D.C.

POSSIBLE CANDIDATES FOR PSAC

Edward L. Ginzton

Chairman and Chief Executive Officer, Varian Associates. Member NAE and NAS. Chairman NAS Panel on Automotive Exhaust Standards. Man who devised and promoted SLAC.

W. G. (Gerry) Shepherd

Academic Vice President, University of Minnesota. Former dean of engineering. Former president IEEE. Member NAE.

Seymour W. Herwald

Vice President for Engineering, Westinghouse. Former president IEEE. Member NAE.

Howard W. Emmons

Professor of Mechanical Engineering, Harvard University. Prominent aerodynamics expert. Member NAE and NAS.

W. Kenneth Davis

Vice President Bechtel Corporation. President, Atomic Industrial Forum.

PRESIDENT'S SCIENCE ADVISORY COMMITTEE

Health Services Research and Development Panel

Charge

To examine critically the current contribution and future potential of health services research and development in improving the health status of the nation, with particular reference to:

A. The contribution of health services research and development in the formulation and evaluation of national health goals, priorities, and strategy;

B. Problems and priorities for health services research and development in the decade ahead;

C. Sources and level of support;

D. Organizational and structural requirements for health services research and development;

E. Development of manpower, information systems, and other resources to support health services research and development;

F. Communication of research findings.

PRESIDENT'S SCIENCE ADVISORY COMMITTEE

Health Services Research and Development Panel

Definition

Health services research and development is an "applied" field. The objectives of the field are twofold: 1) to improve the delivery of patient care, and 2) to make more efficient use of scarce resources.

Health services research and development is concerned with the full spectrum of personal health services, from preventive measures through arrangements for treatment to physical and social rehabilitation, provided by health personnel.

The focus is on the processes of applying biomedical knowledge to treat, control or eliminate disease in communities and throughout the nation, rather than on the development of that knowledge.

Usually "personal health services" are differentiated from "environmental health services," which do not involve direct contact between health professionals and individuals.

The major areas of concern to health services research and development are: 1) the financing of personal health services; 2) the production, distribution and performance of health services personnel; 3) the development and use of health services-facilities and equipment; 4) the organizational framework for providing health services; and 5) the health services consumer - his needs, his use of services, and the effect of services on his health.

Health services research encompasses those aspects of technological research directed at solving problems peculiar to the health services industry. It customarily requires establishment of demonstration projects to test new and improved methods for providing health services.

August 5, 1971

PSAC PANEL ON HEALTH SERVICES R&D

NAME	POSITION AND ADDRESS
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SPEECH PRESENTED BY DR. EDWARD E. DAVID, JR., SCIENCE ADVISER TO THE PRESIDENT, AT EASCON MEETING, WASHINGTON, D. C., ON OCTOBER 7, 1971

It is a great pleasure to rejoin old and valued colleagues. I might say that I value you more now than when I worked exclusively within the disciplines the IEEE represents. From the perspective of the White House, the Institute appears stronger and more relevant today than ever before. I am particularly pleased with the conference theme of EASCON -- technology is alive and needed. I am glad too that you didn't add that it is alive and living in the Soviet Union or China.

The timing of your meeting is auspicious for we are arriving at a stage in the nation's development when technology must respond in an unaccustomed way. It is almost as though we were again in the era of the early 1940's when technology had to confront the Nazi challenge. Today the situation is more complex, for the villain is more diverse, less identifiable, and indeed will not succumb to a brute force approach. Nevertheless, the IEEE and other elements of the scientific and technological community must respond, and respond adequately, if the nation is to meet the challenges of the 70's. Most significant, we have a President who not only recognizes this situation very well but who is insisting on vigorous and purposeful action in applying science and technology. I share the President's feeling, and

let me tell you briefly today how my office and other elements in the federal government are responding to these demands. The overall programs that emerge may set the tone and direction of R&D for years in the future.

You must pardon me if I have telegraphed my punch, but I wanted to bring to you the President's direct support of your conference theme, that technology is alive and needed. He has made this quite clear to me personally and in a number of recent public statements, and here let me quote from one of them. When speaking to a recent Joint Session of the House and Senate, he said:

> "Let us find the means to ensure that in this decade of challenge, the remarkable technology that took these Americans to the moon can also be applied to reaching our goals here on earth.
>
> "That is why, in the next session of the Congress, I shall present new proposals in both of these areas: tax reform to create new jobs, and new programs to ensure the maximum enlistment of America's technology in meeting the challenges of peace."

In the months ahead, we will be working hard to give substance to these statements by formulating the bold and imaginative elements necessary to capitalize on the opportunities of the day.

You may be interested in knowing a bit of the inside story as to how the President's statement is being implemented, what directions seem promising, and who the principal characters are. As you may know, I hold not one job but four. As Science Adviser to the President, I have unique access as a scientist to the upper levels of the executive machinery of the government. The Science Advisory post has been in existence since 1957 and the first person to hold the job was Dr. James R. Killian. It has been traditional that the Science Adviser is also chairman of the President's Science Advisory Committee. Through this committee and a roll of consultants which runs to over 200, the President has access to the best technical advice available in the country and, I dare say, the world. This is a most important element in formulating new programs that above all must be technically sound.

As the Director of the Office of Science and Technology, I have a staff of about 25 professionals. This staff covers all of the physical and life sciences, also including the practice of engineering and medicine. Too, we are coming to appreciate the cogency of the social sciences. Social sciences are becoming more and more heavily involved in matters which yesterday could have been considered purely from a technological vantage point. Within my own office I find that operationally to be true, for one of the most vital contacts we

have is with that much-maligned and highly skeptical group called the Office of Management and Budget. OMB exerts strong influence over the federal purse-strings, and in decisions to embark on new programs. Between OMB, OST, and other White House elements, the President has increased potential for the making of a science and technology policy for the nation, a potential which we are now seeing come to fruition.

The fourth job which I hold is Chairman of the Federal Council for Science and Technology. This Council consists of the principal R&D officers of the federal government and provides a unique glimpse into the workings and programs of the agencies, including everything from NASA to Agriculture and from DOD to Interior. It is through this mechanism that certain programs are coordinated across agency lines. For example, our Interagency Committee on Atmospheric Sciences coordinates weather modification programs in NOAA, NSF, Interior, and Agriculture. In formulating new programs, the Federal Council provides an effective input from the entire gamut of federal apparatus.

Now, perhaps all of this sounds neat and straightforward but as you all know, things are actually done in any organization in quite different ways than one would think from merely examining the

organization chart. Within every organization there is an infra-structure that exerts the lion's share of creative thought. Somehow many of the best ideas arise spontaneously outside the formal organizational structure. In trying to trace back the motivations for our studies of new technological opportunities, I find there is indeed that degree of spontaneity.

The beginnings of that go back to when I first assumed my present job about one year ago. It was very clear that a principal task would be to bring new programs into being to keep the nation in the technological forefront. Aerospace and defense research and development had declined and technological unemployment had reached levels of about 35,000 or more. Productivity in the economy had been more or less stagnant for a period of months, and the now advertised trade deficit was beginning to appear. It was clear to me that an invigorated R&D program could be an important tool in meeting the challenges inherent in these situations. It is worth noting that not all segments of opinion would agree that R&D is a key to productivity, trade, and jobs. Many economists believe that manipulation of economic variables -- taxes, allowances, and the like -- can provide solutions. I agree that in the short-term they can. The longer term calls for programs with substance to produce new products and new industries.

With this in mind, the first step was to organize OST to take

effective action. During the past year we have evolved an organization which closely matches the President's image of a reorganized federal executive. Now we have a military and national security division, a natural resources and environmental division, a human resources division, and a division of civilian technology. Though this reorganization has been functional for sometime, it wasn't until late last month that we bothered to formalize it with the usual flow-chart. As those of you familiar with OST know, our staff comes to us from universities, industry, and other government agencies. They serve for varying periods, but two years is about par for the course. Then they return to their own jobs, campuses, or industry. Over the past year we have had a 50 per cent turn-over and that was completed last month without losing momentum on our route to our main goal of a program of technological programs to keep the country competitive.

The role of OST and the infra-structure to which I referred earlier is illustrated very well by the President's Energy Message which he sent to Congress on June 4 of this year. The message proposed three significant initiatives. One was the completion of a demonstration liquid-metal-fast-breeder power reactor by 1980. Since his June 4 message, the President has announced construction of a second such plant. The second initiative proposed pilot plants

to investigate several methods of reducing sulphur oxide emission from fossil power plant stacks. The third initiative proposed a pilot plant for the production of clean gas fuel from coal. In total, the President has requested some $87 million of increased federal funding, and there is in addition over $200 million of industry support pledged as of today. In this message the President also called on OST to undertake further studies of possible new technological developments covering the fields of energy sources, techniques for distribution, and more efficient consumption. The message was remarkable to me because it is the first in which a President has proposed an R&D solution to a national problem, and this certainly bodes well for the future of science and technology. The Energy Message, I feel certain, is the first of many in this spirit.

I raised the subject of the President's Energy Message so I can indicate how it came about. Three members of my staff in OST worked for several months in reviewing all of the many energy studies which had been done in the past. These amounted to at least 20 principal efforts over the past ten years by such diverse elements as Resources For The Future, the Petroleum Council, and Cornell University. OST itself issued several reports on narrow segments of the overall energy problem. In reviewing all of this it became quite

clear that a national energy program was required. To crystallize it a committee of the Domestic Council at the White House, chaired by Dr. Paul McCracken who is Chairman of the Council of Economic Advisers, was appointed. I was a member of that committee and it encompassed the many federal interests in the energy problem. The final Energy Message was the result of the deliberations of that committee which brought to bear not only scientific and technical ideas but also economic, legal, social and political considerations. Thus, action of the kind represented in the Energy Message is the result of a coalition of many forces, capped of course by a Presidential decision. A similar infra-structure and mode of action preceded the President's health message which placed heavy emphasis on technology for health care delivery, and also the same thing was true for the cancer initiative which is being implemented this year.

This coalition of forces will be a principal ingredient in formulating new programs to sustain the goal of technological leadership. It all began to come together in April of this year. About that time Dr. Paul McCracken, Chairman of the Council of Economic Advisers, made a speech in which he spoke eloquently of the importance of research and development to the well-being of the economy. Later, after a joint effort between the Council and OST, Dr. McCracken and I sent a letter to the President outlining some ideas for stimulating research and development activities in industry. These ideas are

still under study, but mention of them has appeared in the press. Generally speaking, they have to do with increasing the pace of innovation through incentives of various kinds.

Somewhat later, Mr. Peter Peterson, formerly President of the Bell & Howell Company, joined the White House staff and emphasized the importance of the coupling of foreign trade balance and high technology products. Again, joint consultations between his staff and OST produced several actionable items pointed toward increasing the competitiveness of American industry with Japan, the European Economic Community, and other nations. As time passed, other important elements were added to the infra-structure, including encouragement from General Bernard Schriever and a number of private advisers. All told there seemed to be a definite groundswell in recognition of the importance of R&D for the national well-being.

All of this, plus the encouragement of the President's Domestic Council, led me and Dr. Goldmuntz, who is Executive Director of the Federal Council for Science and Technology, to begin work earlier this year with the agencies to study specific technologies in the same spirit as we did in our earlier work preceding the Energy Message. Over the past two to three months, we have worked with many people in the federal agencies and departments and with outside consultants

to uncover promising ideas. I am in no position at the present time to tell you about specifics, for their merit and ultimate fate are by no means decided. I can say, however, that they represent a creative effort on the part of the federal R&D community which goes beyond anything I have seen produced in the recent past. Contributions have come from the officials and staff of the Departments of Transportation, Housing and Urban Development, Interior, Commerce, EPA, NASA, Agriculture, the National Science Foundation, and HEW. The proposals range from advanced transportation systems to increased protection from natural disasters and improved air quality. And all of them are feasible only through technology-intensive systems or products. I am particularly pleased that all of the proposals include a strong quality-of-life component, almost routinely. This indicates the significant progress we as a nation have made in reconciling high technology with human and environmental considerations.

Another aspect of these proposals is that they are pointed principally at demonstration or prototype activities. Referring back again to the Energy Message, all three of the programs there, the breeder reactor, the sulphur oxide removal trials, and the coal gasification plant were pointed at either demonstration or pilot operations. As you well know, this is a necessary stage in bringing a technology to the level where it can lead to a marketable and useful

product. It is also a stage of development in which large funding is usually required and in which government participation with industry is appropriate. Again, the prototype of the energy program is relevant here, for both the power utilities and the equipment manufacturers are participating by providing a major share of the financing. In addition, of course, we must continue to develop new technology and to assure U.S. leadership in exploratory research.

The ideas received from the agencies and departments are now being evaluated technically by my staff and by special panels of consultants. The task here is clear, to be certain the proposals are scientifically and technologically sound. This, of course, is the key item and it is the heart of the Science Adviser's job to assure high quality in federal R&D. I would be less than frank if I did not say that some of the ideas and proposals are warmed-over rejects. They range all the way from outright nonsense and pet projects with little or no contribution to make to first-class new ideas which are very likely to provide entirely new thrusts and directions. We are in the process of sifting these. We may end up with four or 400. We as yet don't know the answer, but we can testify that technology is very much alive and we intend to cultivate it.

As for what happens from here, the output from OST will be subjected to similar, tough evaluations in terms of social, financial, legal, and other considerations. As I indicated, we have a strong coalition of forces to undertake this examination. Our infra-structure will certainly examine them for their impact on domestic problems and opportunities and on foreign trade. An important new ally in all this is a new addition to the White House staff, Mr. William Magruder. Bill Magruder knows the ins-and-outs of technology and industry. It was only a month ago that he was appointed Special Consultant to the President. He is a strong resource in bringing this effort to fruition. He, I, and others will cooperate in framing an overall package which will bring all of the considerations into balance.

As you can tell, this is a very ambitious undertaking but we hope to have it in the initial form before the end of the year. It is too early to tell what programs will emerge, for the ultimate goal is to produce solid programs which can contribute to significant national opportunities, to economic growth, to exports, and to technological leadership, and of course to the quality-of-life of the nation as a whole. In addition, I have great expectations for this program in terms of its effect on the technical enterprise of the nation. I believe that it can

provide a base of inspiration for invigorating our enterprise by setting meaningful goals such as the President's "clean energy for the 70's and 80's". Most of all, I think this effort reinforces the theme of your conference that technology is alive and needed. You can be sure that the President shares your conviction.

# # #

HARVARD UNIVERSITY
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DIVISION OF ENGINEERING AND APPLIED PHYSICS
OFFICE OF THE DEAN

July 28, 1971

AUG 23 1971

Mr. David Z. Beckler
Office of Science and Technology
Executive Office Building
Washington, D. C. 20506

Dear Dave:

In the course of my presentation of the OECD report to PSAC on July 19, you may recall that you requested that I transmit to you the outline of the more detailed recommendations which I said I had prepared in connection with the earlier drafting stages of the report. These recommendations are somewhat more concrete, and perhaps succinct, than those formulated in the report itself, since members of the committee felt that many of them were too unique to the U.S. situation and not sufficiently general. Nevertheless, you indicated that you might find these recommendations useful in connection with further discussion of the report.

It is my intention in fact to try to go through these recommendations and use them as the basis for a fairly lengthy personal letter to the Secretary General, expressing my own point of view.

In point of fact, I believe that you do already have in your files a copy of this set of recommendations, which I sent to Hugh Heffner last September in response to his request for a progress report on the OECD study. However, I realize that I have sent you so many documents in various connections that perhaps you will have difficulty in locating the correct one, and for this reason I am sending you another xerox copy. You are of course welcome to distribute this material to the members of PSAC or of the Haggerty panel as you see fit, although I imagine that you may have to retype the material in order to make it legible.

Sincerely yours,

Harvey Brooks/ms

Harvey Brooks

HB:ms

Outline of OECD Recommendations and Conclusions

1. Higher education and scientific manpower

a. Is there an excess, deficiency, or wrong mix of the output of higher education, especially from the post-graduate level? In most OECD countries number of places in higher education at all levels has been set by social demand rather than by analysis of the future needs of society. The post-academic employment market has been thought to set the choices of students indirectly, and this has been thought a sufficient manpower policy without further channeling into specific occupations or subjects. As a result the system of higher education has tended to expand proportionally in all its parts including research. This whole approach is now coming into question as experience indicates that the social demand for advanced education has much greater capacity for growth over long periods of time than was originally thought. On the other hand demand is very hard to forecast, as the future needs of society are hard to foresee, and new developments in science and technology, as well as new aspirations and expectation created both by science and technology and by social change, change perceived social needs. The time lag between entry into higher education and entry into the employment market means that market incentives have too long a time lag with the present rapid rate of change to accurately channel manpower. The excellent studies begun by OECD of the economics of supply and demand for educated manpower, and of the economics of higher education in general, should be continued with special emphasis on manpower forecasting. A special problem is how to achieve greater equality of opportunity with respect to higher education without creating a large pool of individuals overeducated for the occupations open to them.

b. There is need for much closer study of the income redistribution aspects of higher education, and the comparison of social and private returns

to higher education under the conditions of mass higher education now existing or soon to exist in the OECD countries. Such studies need to be broken down by field of study, and intercomparisons between countries should provide a useful perspective.

c. In future planning for higher education in the OECD countries greater differentiation in teaching approaches, organization, and research orientation should be sought among institutions in order to accommodate to a wider variety of cognitive styles, and to allow the economies and benefits of greater institutional specialization. Uniformity no longer has the social utility that it did when higher education was for a small elite which would enter a few key professions and occupations. There is also a need for a better integration of higher education and work experience, and a more gradual transition from education to work, with some education continuing formally throughout an individual's working life.

2. Support of basic research

a. The current shift in emphasis away from high-technology space-defense research does not imply less basic research to meet society's future needs, but does imply some shift of emphasis particularly towards the understanding of complex interdependent systems and the sciences that deal with the natural environment as such a complex system. For example, there is a need to deepen understanding of the ways in which modern technico-economic systems function, in order to sharpen the tools for the macro-management of economies--tools which appear to be losing their efficacy under modern social conditions.

b. The emphasis on technological assessment and wise environmental management means that in the introduction of new technology a considerably higher ratio of fundmental and exploratory type applied research to development may be needed than in the past, because the forecasting of side-effects requires more fundamental understanding than the mere

demonstration of technical feasibility and commercial promise.

c. Since the results of basic science are in part available to all nations, there is a temptation as communications improve for each nation to underspend on basic science in the hope of taking economic advantage of the science produced in other countries. In consequence it may become necessary to arrive at some general international understandings about minimum levels of fundamental research in each country as a proportion of GNP. Conversely, in the planning and evlauation of fundamental research in each country an increasingly international orientation is necessary. This would include the consultation of scientists in one country in evaluating research proposals or planning facilities and programs in another.

d. The present level of funding of fundamental research in small scale science should be maintained as a proportion of GNP in the OECD countries, while encouraging those countries that are lagging in this respect to gradually bring their level of support up to the others.

3. International cooperation in large scale science

a. This refers to fundamental science requiring unique and usually large scale facilities such as accelerators, radio telescopes, or satellites, as well as more general purpose facilities such as oceanographic research vessels.

b. While international financing of some large scale facilities might be desirable, the associated political complications make this difficult, and in the meanwhile there is much more that could be done in the way of international planning of major national facilities so as to achieve the maximum possible degree of complementarity between national programs. The ultimate objective of international planning must be to see that expensive and unique experimental and observational capabilities throughout the world are used for the most important and significant experiments irrespective of the national origin of the

proposers. While a certain amount of national competition in science is a stimulus to excellence, the OECD countries at least should be moving away from national competition, especially in big facilities, and towards a more international orientation. This is necessary in order to get the most value out of national scientific investments, but in addition international cooperation in large scale basic science can set a model for cooperation in other areas and help in some of the international institution building that will be necessary increasingly for the control and regulation of technology on an international basis.

c. The OECD science policy committee should take the initiative in creating working parties to explore and develop plans for greater cooperation and planning among OECD countries in selected areas of "big science". Although such cooperation in technological and applied science areas, particularly those related to the environment, are not excluded, we believe that fundamental science provides the most fruitful and promising area for joint planning and sharing the utilization of facilities in the near future. One possible undertaking of such task groups would be to prepare inventories of major fundamental research facilities in the member countries, and to make such inventories widely available to the scientific community. It may also be desirable to explore the feasibility of making a number of international fellowships available specifically for the purpose of encouraging the cross-national utilization of major basic science facilities. OECD might well serve as the agency for the selection of fellows and the administration of the program.

d. In operating in the international science area OECD must recognize the many other international bodies, official and non-official, which are already active, and try to avoid duplication or pre-emption of international activities that are already going well, for example,

the Global Atmospheric Research Program, or the International Biological Program. We believe, however, that the major facilities area is one in which there has not been as much joint planning as is possible, and that here some encouragement and push from governments is needed. This sort of joint planning effort, however, must be sold to the scientific community on the basis that it makes possible qualitative accomplishments which would not be possible on a national basis, not as a pretext for delaying or cancelling national programs.

4. Determination of scientific priorities

a. A fairly sharp distinction must be drawn between priority determination in technological development, where the benefits are fairly well definable in advance, and basic science, where the benefits are usually definable only on the basis of historical experience, and not with relevance to particular defined areas of social need.

b. The determination of priorities in fundamental science is a complex process involving many inputs, including how the individual scientist assesses the opportunities and problems and thus chooses to invest his own time and effort, plus the external influences that affect his choices. Relevance of basic science to defined areas of social need is elusive and uncertain, and this limits the possibility or effectiveness of determining priorities in a centralized fashion. Thus any system of centralized priority setting must receive an extensive input from the scientific community, and must allow a sufficient margin of support for projects of high scientific excellence which do not fit the selected priorities of the moment, and which are representative of the priority choices of individual scientists and research groups of demonstrated capability and accomplishment. The determination of priorities may be thought of as embodying a three-way trade off between intrinsic scientific interest, social relevance, and cost. Thus social relevance of a project may justify a lower quality cut-off, while projects of high quality and low cost should receive support almost independent

of social relevance. The most difficult choices probably lie in the area of combined high cost and high intrinsic scientific interest with relatively low apparent social relevance. In this domain the existence of a substantial international consensus, and a degree of international planning and consultation could be most helpful in reinforcing choices. The other area of uncertainty is that of combined high apparent social relevance and high cost with relatively low current scientific quality and intrinsic interest. Here the question arises whether increases of support will attract higher quality people into the field, and result in the turning up of new scientific questions of greater intrinsic interest. Support of such programs temporarily on a sheltered basis is justified, but should not be continued indefinitely unless the quality in the field becomes comparable with that in other areas of basic science. As the resources for basic science become smaller relative to the scientific opportunities which can be pursued---a situation which appears almost inevitable, since science grows exponentially while resources tend to grow arithmetically---it will be increasingly necessary to develop methods of cross comparison of quality between widely different fields which will have credibility in the scientific community and with the public. It seems that this should be an issue of special concern to the science policy committee of OECD. OECD might wish to consider holding a conference on priority setting for basic science, analagous to the Jouy en Josas conference on science policy of a few years ago.

c. For the purpose of discussing priorities it may be useful to classify basic academically-oriented science into four categories as follows:

1) General support for the infrastructure of science without regard to field. In Europe and the U.K. this includes that part of research activity in universities which is supported through instit-

utions and by ministries of education and science. It would generally comprise faculty support, post graduate student stipends, general purpose laboratory equipment and technical services, and other expenses not highly specific to particular projects. The volume of this support must be related in some way to overall technical manpower needs and to higher education policy in general.

2) Support for research projects in small scale science chosen primarily on the basis of intrinsic scientific interest and excellence and the quality of the people involved without reference to centrally determined priorities of fields or institutions. The volume and distribution of support in this category should be related to "proposal pressure", i.e. to the sum of the decentralized choices of individual researchers and small research groups.

3) Support for research in fields selected for special emphasis either on the basis of unusual scientific opportunity and promise or on the basis of social importance or a combination of the two. Such support may and probably should be selective also as to institutions in order to insure the creation of "critical mass" efforts in the selected fields. It is in this area that centrally determined priorities are appropriate.

4) Construction, operation, and support of science in unique and complex facilities of the "big science" variety where, again, concentration of effort and support is required to achieve the most significant progress. This again is an area in which centrally determined priorities are appropriate. However, in many cases the detailed choices of experiments and smaller instrumentation should be left for decentralized choice and support more along the lines of category 1, with mechanisms set up to insure as far as possible access to the facilities on the basis of the intrinsic scientific merit of the experiments proposed.

d. Analysis of the national programs of the OECD countries on the above basis of categorization is easy or difficult depending upon the general organizational structure. It corresponds more closely to the UK and European structure than to the American. However, it would be a major contribution towards a more rational and coherent science policy with respect to basic science if the scientific programs of the OECD countries could be analyzed on a comparable basis according to the above scheme, and this might well be undertaken as the next step in the statistical studies being conducted by OECD.

5. Technological assessment and environment

a. Since the 1962 report the emphasis of science policy has been on policy for science, i.e. on the allocation of resources to scientific research and technological development, and on the role of science and technology in economic growth and industrial development. During the coming decade the emphasis must be much more on science for policy, i.e. on the input of scientific considerations in policy decisions of a social, political, or economic nature. As an example there is need for much greater attention in science policy to the operation and evolution of health care delivery systems, including particularly the social science aspects, and the management of health problems at the socio-medical interface. Comparative studies and effectiveness measures of health care delivery systems in different countries might be of particular value and interest. Another area of importance, of course, is the scientific input to policy for environmental protection and management, including measures of effectiveness in this area.

b. The central theme in OECD for the coming decade is that economic growth is no longer enough. This is well expressed in the recent OECD report CPE/WP2(70)6, "The Growth of Output in OECD Countries", in the following terms:

"But the general problem of how to put the fruits of growth to

meeting social wants, and how to mitigate the costs and nuisances created by growth, is common to most countries. International exchange of information and ideas in this field is therefore likely to be useful..... For these reasons a study of some of the central problems of longer term growth, in relation to resource allocation, technological advance, and social choice, and the development of the kind of national and international policy action needed to give better direction to the growth process, should be a major task for the future work of OECD."

We believe that the above recommendation implies a much closer integration of science policy with economic policy than in the past. In the words of Dr. Christensen, "science policy must be brought out of its isolation from economic policy, because economic growth is essentially technological progress." For further development of this theme refer to Dr. Christensen's paper.

c. Recent discussion of technological and environmental assessment has tended to emphasize the negative aspects of technology, and the importance of anticipating and avoiding deleterious "second-order" effects before they attain crisis proprtions. However, it also important to point out that many current problems of society arise from inadequate development of technology for the public sector--apart from defense--in comparison with technology for the manufacturing sector. The very slow growth of productivity in the government services and in the service sector generally, particucarly in education and medical care, has been a major source of inflationary pressures in all the OECD countries, as well as a cause of inadequate social performance of the economic system in relation to individual and social welfare. There is no adequate incentive for innovation or for productivity increase in these areas, and no adequate measure of performance. Many of the deficiencies are clearly technological in the classical sense, notably air traffic control, anti-pollution technology of all kinds,

ground transportation technology, especially the integration of different modes, postal services, health care delivery, public housing, etc. OECD should consider extending its research cooperation activities into areas which relate primarily to productivity in the public sector. The road research work is one example of such an activity which touches on this area. This seems much more promising than attempts at cooperation in areas of more traditional private industrial concern, such as materials or data processing.

d. It is true that technically feasible solutions to many problems of environmental management and control exist, and that we have not adequately applied the technology that is available. On the other hand, it must be recognized that economics and technology cannot be separated in this area, and that many technical solutions are difficult or impossible to apply because of cost and the unwillingness of the public to accept the necessary costs. Thus both technological innovation and more vigorous public policies are needed; neither can probably succeed without the other. Furthermore, additional technical knowledge is needed to provide a basis for properly balancing the risks and benefits of technology.

e. Opinions appear to differ as to the degree to which growing environmental concern and national action to meet it will affect international equilibrium in trade. This is an area which requires continuing reassessment. Considerable self-restraint on the part of OECD countries will be needed in respect to unilateral imposition of standards on the one hand, and aggressive shifting of production to take advantage of lax standards on the other. This may prove a particularly touchy problem in relation to multinational companies unless the different countries in which they operate adopt a concerted stance otwards environmental regulation and standards. OECD should keep this problem under surveillance, and this will require close coordination of economic

and science policy groups.

f. One general issue which arises under the preceding relates to the way in which environmental standards are applied. On the one hand, economic efficiency would suggest moving towards a division of labor in which polluting activities are shifted to countries and regions where the absorptive capacity of the environment is greatest. On the other hand, consistent application of such a philosophy would result in uniform deterioration of the environment, whereas social considerations might argue for the preservation of clean areas. There is also a more detailed technical question as to whether environmental standards should be based on limits of emission at source, or in what degree they should take into account the contribution of a given emission to a tolerable limit of pollutant concentration at a defined location. Although these decisions will be primarily economic in the short term, they cannot be made independently of a knowledge of the technological prospects for pollution control as well as for less polluting manufacturing processes. This again calls for close collaboration between economic and science policy groups within OECD in any effort to deal with environmental problems.

g. Many environmental problems are becoming global in nature and require international collaboration both to assess the extent of the problem and to take remedial action. This is particularly true with respect to certain aspects of atmospheric pollution, the pollution of international waterways, and the contamination of the oceans by pesticides, fertilizers, and radioactive wastes. The technical character of these problems is often not fully understood, and monitoring systems are insufficient to determine what is happening. Since monitoring systems can become very expensive, there is an urgent need for developing a better technico-economic rationale for what to monitor when and where

in relation to the time-urgency of various contaminant problems, the availability and prospects of the necessary technology, and the contribution of each monitoring station to the global assessment. Since the OECD countries are the prime contributors to the problem, it is quite appropriate that OECD should perform a central role in assembling authoritative information in this general field, serving as a central clearinghouse for compiling and evaluating such information, but taking full advantage of the activities of other international grpups, both official and unofficial. Emphasis should be on putting out authoritative status reports which can be readily understood by policy makers and are policy-oriented.

h. All technological progress comes at some cost, and some risk is attendant on the introduction or extension of any technology. Because the public does not understand that technological progress inevitably involves the balancing of risks against benefits a situation exists in which widely different standards are applied in different technological areas. For example, every developed nation accepts an enormous annual death toll from auto accidents yet views with great alarm the possible damage from low level radiation from nuclear power plants. Often it is much easier to quantify the risks of a given technology than it is the benefits, but equally often the converse is true. There is urgent need for a much better intellectual rationale in this whole area. There is the question not only of the sum total of risks and benefits but also their allocation among various segments of society. This is in fact an appropriate field of economic scholarship which is in its infancy. It is a field which badly needs to be freed from its present emotional mystification. It would appear that this is an area in which OECD could do a good deal to stimulate interest, and the science policy committee might consider how this could be done in some representative areas.

6. Multinational firms and technology transfer

a. All studies of technology transfer emphasize the key importance of the movement of ideas and experience with people. Technological know-how, unlike basic science, tends to be relatively undocumented, and to be embodied in the minds and skills of individuals and to be transferred through direct personal interactions and on-the-job learning. It is for this reason that multinational firms are of great actual and potential importance in the transfer and diffusion of technology, and hence in the rapid spread of technological progress. A further discussion of the role of multinational firms is included in the appendix by U. Columbo. The importance of multinational firms, and both the benefits and problems they introduce for national economic policies, warrant a continuing study of the economic and technological impact of such firms. Such studies should be related to the studies of the allocation of costs and benefits of technological progress advocated under item 5 h. above.

b. One of the principal complaints against multinational firms is that their decisions often conflict with national economic and industrial policies, and the threat to relocate gives them much stronger bargaining power than competing or related indigenous industry. The problem exists in the area of labor-management relations, in access to capital markets, and in general personnel and management practices. To some extent the multinational firm has made purely national policies in the economic and even the social sphere obsolete, and there is therefore a growing need for agreement among the OECD ~~MMM~~ countries on the broad objectives of economic and social policy, and for concerting specific actions. This is an area in which OECD has been active, but could become even more active.

7. Technical assistance and underdevelopment

a. National science policies within the developed countries should

be formulated with particular attention to their impact on the LDC's. This would include fostering the development of indigenous capabilities in science and technology relevant to the economic situation of the LDC's, and the opening of markets for the LDC's in the developed countries for labor-intensive industrial production. Investment in the LDC's should be coupled with technology transfer and on the job training of indigenous managers and technicians.

b. The so-called brain drain cannot be counteracted by indentured service of LDC scientists and technologists in their home countries but it should be possible to develop relationships between institutions in developed and undeveloped countries so that LDC scientists have an opportunity to stay in their own countries without becoming isolated from world science.

c. Countries in intermediate stages of development can often be of assistance in the development process of LDC's and should be used for this purpose to a greater extent.

d. OECD should catalogue the activities of its members in science and technology in terms of their relevance to development. While we are not prepared to suggest a definite percentage we believe that the developed countries ought as a matter of conscious and explicit policy devote a certain fraction of their R. and D. activities to problems relevant to development. This would include the provision of opportunities and incentives for scientists and engineers from developed countries to spend periods of time in LDC's both to provide technical assistance and education in situ and to familiarize themselves with LDC problems and conditions.

8. Development and application of the social sciences

a. Whereas almost all the problems addressed by science and technology in the past decade were predominantly technological, in the sense of physical and biological technology, the problems being addressed under

the newer priorities of the 70's all have an important social component. Much of this aspect will have to be dealt with thrpugh managerial and political skills of an intuitive sort that are not based on science. Nevertheless, the knowledge, insight, and methodologies of the social sciences have a great deal to offer in dealing with the social aspects of problems such as medical care, education, pollution, population control, technical assistance, and national planning in such fields as transportation, housing, and land use. Of the social sciences only economics has a long history of inputs at the policy level; this will have to extend to other areas such sociology and political science. The social sciences need to be much better integrated into science policy. Furthermore the spending scale for many social science projects is often inadequate to the questions being addressed; the social sciences will have to learn how to plan, organize, and manage larger and more ambitious projects.

b. The social sciences, with the exception of economics and to some extent psychology, lack an organized profession or subprofession concerned with trahslating knowledge into action and policy, analagous to engineering for the physical sciences or medicine for the biomedical sciences. This represents a challenge to education to train such a profession, and also to government and industry to learn how to use the social sciences. Furthermore, the social sciences have been late in gaining academic recognition, especially in Europe, and until recently have not attracted the best talent. Recently they have made cosiderable strides, and the advent of computer techniques and systems concepts offers great promise for rapid progress in the near future. Like all new and powerful tools, however, these are in danger of bemusing their users and causing them to mistake technical virtuosity for profundity of thought. The biggest danger to the social sciences, however, may

come from excessive popularity accompanied by unrealistic expectations as to what they can accomplish, especially in the short term. This could lead to public disilusion with the social sciences, and to excessive preoccupation with policy-relevant research to the detriment of the development of theory. On the other hand, the demands of practical problems could also help to open up new domains to theoretical study and contribute to conceptual development while also permitting some quantitative techniques to be tried on a larger scale than would be possible with basic motivations alone.

c. The social sciences should be fully included in future R. and D. funding and manpower surveys of OECD.

9. Biomedical sciences and science policy

a. There has been a tendency to leave the biomedical sciences out of discussions of science policy, especially in Europe. In the U.S. biomedical research and associated training accounts for nearly 50% of the research and advanced training Federal funds coming to academic institutions (classified as "academic science"). Biomedical research is becoming less self-contained, both on its basic and applied sides, i.e. it is more interdependent with physical sciences, social sciences, and engineering. On the applied side, as the technology of the cure of disease continues to advance dramatically, emphasis in application shifts to the interface between social and behavioral science on the one hand and biological science on the other--to the socio-medical pathologies such as drug abuse, alcoholism, mental retardation, and diseases originating in environmental factors such as air pollution. Also engineering, economics, and operations research are increasingly involved in rationalizing the system of delivery of medical care. In short the health of the population has become to a growing extent one of the highest priority tasks of science policy, and yet this is not fully recognized in most discussions of science policy.

b. Science policy in the biomedical area includes not only the allocation of resources to and the organization of research in the biomedical sciences, but also policies on the organization and financing of the health care delivery system, on medical and paramedical professional education, on the diffusion of medical technology, and on the management of public health problems, especially those of a socio-medical nature. As indicated previously medical care is a prime example of one of those quasi public sector services where productivity lags. The recent OECD report on inflation (CPE(70)8) points out that "inefficiency in achieving social and other objectives in the public sector is just as much a potential source of inflation as inefficiency or excessive profits in the private sector.....Health and education are examples of areas of government expenditure which manifest strong income elasticities of demand, high labour intensities, and low productivity increases.....the implementation of public health and educational services involves substantial and rapidly rising public expenditure." In the health field the situation is greatly complicated by rising expectations. Productivity is difficult to define. Clearly the discovery of methods of immunization against polio, or drugs to control Parkinsonism, represent enormous reductions in cost to society, and so in a sense increases in productivity. On the other hand, the costs of management of ~~coronary~~ cardio-vascular diseases, for which no cure is available, have escalated enormously, even when measured against the decrease in mortality and morbidity resulting from this care. The economics of health care has usually been a taboo subject. Human health is regarded as an absolute good for which no cost is too much. It is now recognized, however, that since health care is a scarce resource, it is not exempt from the principles of economics. Comparative national studies within OECD might be of particular value in this area.

11. Technology and the structure of work

a. Rapidly rising educational levels of the population are creating a demand that work be not only financially but also psychologically rewarding. This requires more attention to the conscious design of the work experience into the technology of production. This, of course, applies even more to the service occupations than to manufacturing. There is very little knowledge as to what sort of trade-offs are possible between worker satisfaction and productive efficiency, or what role technology can play in improving the psychological satisfaction of occupational experience. In the next decade this may turn out to be one of the crucial social problems of advanced societies. It may well be that the present world-wide unrest among educated youth is caused in part by a universal unwillingness to accept the character of the occupations offered by society on their present terms, and the anti-technology aspects of the student rebellion are connected with a perception that the present occupational structure is determined primarily by the requirements of technology in relation to economic efficiency. In many ways this sentiment is also in direct collision with the crisis of productivity in service and public sector occupations. To the extent that greater personal fulfillment in work entails a loss of economic efficiency in the narrow sense, the collective social goals of society and the individual personal goals of fulfillment may be in direct conflict. All these considerations, of course, also interact with the nature of education and the expectations and world views created by the educational experience. Because of the striking commonality of the problems in all developed societies, there is a need for understanding them in a trans-national context. Many of the superficially plausible explanations of student unrest, for example, which seem to apply in the U.S., are thrown in question when one sees the same situation in other countries where the U.S.

circumstances do not obtain. It may well be that the social conditions created by material affluence are incompatible with the personal styles and expectations needed to maintain, operate, and improve a complex technological society. Thus a major challenge to science policy may prove to be to find new goals for technological innovation related to the adaptation of work styles to the psychological needs of man rather than, as in the past, the adaptation of man to the work styles required for maximum economic efficiency.

b. It is suggested that OECD make an attempt to bring together what is known or being researched on this general topic, possibly in the form of an international meeting similar to those held on the economics of higher education. The focus of the meeting, however, ought to relate to science policy and what science and technology might do to resolve the problems. OECD in such a conference might perform a useful service in defining more closely the nature of the problem outlined above, and thus pointing towards lines of research which might contribute eventually towards its understanding and resolution.

12. Technological diversity

a. The combination of modern technology and "economic rationality" tends to produce what might be described as "technological monocultures." The classical example of this is, of course, intensive agriculture which emphasizes single plant varieties, creating high productivity at the expense of ecological diversity and stability. There is an analagous ecological situation with respect to technologies in the more traditional sense. The automobile drove out urban mass transit. The aircraft is driving out the passenger train, especially in the U.S. The transatlantic jet aircraft has all ~~bann~~ but eliminated ocean travel. There are hidden social costs associated with

this driving out of older technologies that often do not become apparent until irreversible social or economic changes have locked society in to the new way of life associated with the new technology. Suburbia and the automobile are good examples. The understanding of such relationships is one of the subtler and more difficult aspects of technological assessment.

b. The situation described above is produced in part by the returns to scale which are always characteristic of technology. Thus a growing technology always tends to become more efficient, and hence cheaper, while a shrinking technology tends to become less efficient, and hence more expensive. This situation is further aggravated by lags in structural adjustment and in labor mobility. But the situation is often further aggravated by the actions of governments. Governments take action to foster new and beneficial technologies in their early stages, often establishing hidden subsidies. This may be desirable for an infant technology, which needs special encouragement when it is on a small scale, since it cannot compete with established technologies until it has expanded enough to enjoy returns to scale comparable to those of well-established technologies. However, policies appropriate for infant technologies tend for political reasons to be perpetuated beyond the time when they are really beneficial from a broader social viewpoint. In this way governments foster the development of technological monocultures beyond what would have occurred through the autonomous working of the private market.

c. The above situation applies particularly with respect to technologies which compete with each other for the satisfaction of the same or similar social needs. The classic case is, of course, the various modes of transportation. The situation is less serious when the organization of production is such that the trade-off between various means takes place within a single economic unit, as it does to

a greater degree in the field of communications. Thus the organization of both industry and government along lines of purpose or function rather than means or technique has certain advantages in these terms, although these advantages are counterbalanced by the economic efficiency which tends to result from bringing together commonality of means that serve a variety of different ends, thus facilitating the transfer of technology from one social purpose to another. (Cf. N. Rosenberg, "Economic Development and Transfer of Technology", in Technology and Culture, Vol. 11, No. 4).

c. Technological diversity thus may provide hidden social benefits or "external benefits" which require social intervention to maintain them. This also relates to the satisfaction of work discussed under the previous section. The trouble is that the argument too easily slips over into an argument for subsidizing inefficient economic operations. The original argument for farm subsidies was the maintenance of the social and psychological values of the family farm, and similar hidden subsidies are provided in many OECD countries for the inefficient small retail distribution outlet. There need to be ways of quantifying and defining the social benefits, if any, which result from maintaining such economic inefficiencies. Modern production processes, using computer techniques, offer the possibility of re-introducing much more diversity into the production process, and in many types of services. Similarly there is a possibility that sophisticated tools can be designed to be used by individuals as an alternative to the extreme division of labor on the production line. This kind of question needs to be studied.

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ROGERS, Paul, cons. structural engr., educator; b. Berettyoujfalu, Hungary, July 10, 1909; s. Ferdinand and Charlotte (Ehrmann) R.; B.S., Ecole du Genie Civil, Paris, 1934, C.E., 1937; postgrad. Ill. Inst. Tech., 1941; m. Charlotte S. Katz, Dec. 25, 1934; children—James Clyde, Anita Joyce. Structural designer Pub. Utility Engring. & Service Corp., 1941-42; structural engr. A. J. Boynton & Co., Inc., 1942-44, Hiram Walker & Sons, Inc., 1944-45; sr. structural engr. Roberts & Schaefer Co., 1945-46; cons. engr., 1946-47; head structural dept. Ralph H. Burke, 1947-49; structural design engr. Sargent & Lundy, 1949-52; partner Rogers & Snitoff, Inc., cons., 1952-54; pres. Paul Rogers & Assos., cons. engrs., Chgo., 1954-66, Rogers-Cohen-Barreto-Merchertas, 1966—; v.p. Hamon, Inc.; chief structural engring. Daniel, Mann, Johnson & Mendenhall, Los Angeles, 1965—; asst. prof. Chgo. Tech. Coll., 1941-46; lectr. Ill. Inst. Tech., 1951-54, Northwestern U. Grad. Sch., 1954-56, A.I.A. Recipient award Am. Iron and Steel Inst., 1963; Eminent Engr. award Ill. Soc. Profl. Engrs., 1965. Registered professional engineer, New York, Pennsylvania, Indiana, Cal., Fla., Ia., Ore. Nev., Wis., Mich., Va., Colo., Ill. Fellow Am. Soc. C.E. (J.J.R. Croes gold medalist 1953; sec. Ill.; mem. Structural Engrs. Assn. Cal., Western Soc. Engrs. (awards 1950, 54), Nat. Soc. Profl. Engrs., Am. Concrete Inst., Internat. Assn. Bridge and Structural Engring., Chambre des Ingenieurs Conseils de Franec, Cal. Soc. Profl. Engrs. (1st v.p. Santa Monica chpt.), Cons. Structural Engrs. Assn. (dir.). Societe Des Ingenieurs Civils de France. Author articles in field. Author: Steel Columns, Eccentricnily Loaded; Fixed End Moments. Co-author: American Civil Engineers Practice. Home: 1643 Clear View Dr., Beverly Hills, Cal. 90210; also 1121 Michigan Av., Wilmette, Ill. 60091. Office: 5 N. Wabash Av., Chgo. 60602; also [illegible]

ROGERS, Ralph Knickerbacker, mgmt. cons.; b. Troy, N.Y., Nov. 18, 1897; s. Howard C. and Ellen (Holton) R.; Ph.B., Brown U., 1919; M.B.A., Harvard, 1921; m. Jean Lindsay Withrow, Oct. 12, 1929; children—Jean H., Ralph W., John H. Securities analyst Henry B. Lindsley Co., 1921-25; supervising indsl. engr. The Thompson & Lichtner Co., Inc., Boston, 1925-29; mfr. staff exec. Bauer & Black div. Kendall Mills, Chgo., 1929-31; cons. bus. orgn. and adminstrv. controls, 1931-39; partner Rogers, Slade & Hill, N.Y.C., 1939-62; chairman of Rogers, Slade and Hill, Inc., 1962—. Mayor of Village of Scarsdale, N.Y., 1963-65, trustee, 1959-63. Mem. Assn. Cons. Mgmt. Engrs., Am. Mgmt. Assn., Soc. Advancement Mgmt., Econ. Club N.Y., Newcomen Soc. N.Y. Presbyn. Clubs: Town; Harvard (Boston), Harvard, Union League, M.I.T., Harvard Business School (N.Y.C.). Home: 81 Greenacres Av., Scarsdale, N.Y. Office: 30 E. 42d St., N.Y.C. 10017.

ROGERS, Robert G., pres., chmn. exec. com. Crown Zellerbach Can. Ltd. Address: 1030 W. Georgia St., Vancouver 5, B.C., Can.*

ROGERS, Robert S., adminstrv. v.p. VWP United Corp. Address: 4000 1st Av. S., Seattle 98134.*

ROGERS, Robert Walmer, banker; b. Bluffton, Ind., May 6, 1908; s. Wharton W. and Maggie (Walmer) R.; B.A., Northwestern U., 1930; student Inst. Mgmt., Northwestern U., 1962; m. Elinor Buddig, July 22, 1933; children—Robert Walmer, Linda Jean. With Harris Trust and Savs. Bank, Chgo., 1930, v.p., 1949-67, sr. v.p., 1967—; v.p., dir. Midwest Bank Card System, Inc.; dir. Gerber Products Co. Mem. investment com., bd. pensions United Methodist Ch. Mem. Charge Account Bankers Assn., Ill. C. of C., Robert Morris Assos., Nat. Canners Assn., Beta Gamma Sigma, Delta Upsilon. Clubs: Bankers, University (Chgo.); Westmoreland Country (Wilmette). Home: 933 Pontiac Rd., Wilmette, Ill. 60091. Office: 111 W. Monroe St., Chgo. 60690.

ROGERS, Robert Wentworth, educator; b. Boston, Dec. 1, 1914; s. Lester Frances and Elizabeth (Gill) R.; A.B., U. Mich., 1936; M.A., Harvard, 1937, Ph.D., 1942; m. Jeanne Francis Way, May 18, 1946 (dec. 1955); foster children—Susan Way, Sarah Wentworth; m. 2d, Elizabeth Belcher Yudkin, Nov. 23, 1956; one son, John; foster children—Michael Yudkin, David Yudkin. Instr. English, senior tutor Dunster House, Harvard, 1946-48; asst. prof. English, U. Ill., 1948-51, asso. prof., 1951-55, prof., 1955—, exec. sec. dept. English, 1953-57, acting head, 1956-57, head dept., 1957-64, dean, Coll. Liberal Arts and Sciences, 1964—. Bd. dirs. Center for Research Libraries, 1946-47. Served from ensign to lt. (s.g.), USNR, 1942-46. Guggenheim fellow, 1957-58. Mem. Modern Lang. Assn., Nat. Council Tchrs. English (adv. council 1960-62), Midwest Modern Lang. Assn. (pres. 1960-61), Am. Assn. U. Professors, National Association Chairmen Departments English (sec.-treas. 1963-64), Am. Conf. Acad. Deans, Council Colls. Arts and Scis., State Univs. and Land Grant Colls., Phi Beta Kappa, Phi Kappa Psi, Psi Upsilon. Author: The Major Satires of Alexander Pope, 1955. Editorial bd. Jour. English and Germanic Philology, 1954-66. Home: 601 W. Michigan Av., Urbana, Ill. 61801; also Brook Rd., Monomet, Mass. ◎

ROGERS, Rodney Albert, biologist, educator; b. Lucas, Ia., Aug. 24, 1926; s. Harold A. and Ardis (Allen) R.; B.A., Drake U., 1949, M.A., 1951; Ph.D., U. Ia., 1955; m. Frances A. Ritchey, July 1, 1956; children—Robert, William. Asst. prof. biology Drake U., Des Moines, 1955-60, asso. prof., 1961-64, prof., 1965—, chmn. biology dept., 1966—; asso. program dir. NSF, 1967-68. Served with AUS, 1944-46; PTO. Mem. A.A.A.S., Am. Inst. Biol. Sci., Am. Soc. Parasitologists, Soc. Am. Microbiologists, Am. Soc. Zoologists, Am. Assn. U. Profs., Am. Soc. Tropical Medicine and Hygiene, Sigma Xi, Omicron Delta Kappa. Home: 4203 40th St., Des Moines 50310.

ROGERS, Roy, motion picture actor; b. Cincinnati, O., Nov. 5, 1912; s. Andrew E. and Mattie Martha (Womach) Slye; m. Arlene Wilkins, 1936 (died, Nov., 1946); children—Cheryl Darlene, Linda Lou, Roy Jr., Marion, Scottish Ward; married 2d to Dale Evans; children—Robin (dec.), John, Mary Little Doe, Deborah (dec.). Organized, appeared with band, Sons of the Pioneers, 1932-38; starred in first movie, Under Western Stars, 1938; has since starred in eighty-nine western pictures. Radio singer, 1937—; on TV as guest, also on own program; actor and producer television films. Pres. Roy Rogers Enterprises; owner Roy Rogers Apple Valley Inn, resort hotel. Mem. Musicians Union, Am. Fedn. Radio Artists, Screen Actors' Guild, Am. Guild Variety Artists. Mason. Office: 9100 Sunset Blvd., Los Angeles 69.

ROGERS, Rutherford David, librarian; b. Jesup, Ia., June 22, 1915; s. David Earl and Carrie Zoe (Beckel) R.; Bachelor of Arts, University of No. Iowa, 1936; M.A., Columbia, 1937, B.S. (Lydia Roberts fellow), 1938; m. E. Margaret Stoddard, June 4, 1937; 1 dau., Jane Shelley. Asst. N.Y. Pub. Library, 1937-38; reference librarian Columbia College Library, Columbia U., 1938-41, acting librarian, 1941-42, librarian, 1942-45; research analyst Smith, Barney & Co., N.Y. City, 1946-48; dir. Grosvenor Library, Buffalo, 1948-52; dir. Rochester Pub. Library 1952-54. Mem. Examination Com. for Pub. Librarians' Certificates, N.Y. State 1951-54. Chief personnel office N.Y. Library 1954-55; chief reference department, 1955-57; chief assistant librarian of Congress, Washington, 1957-62, dep. librarian of Congress, 1962-64; dir. univ. libraries, Stanford U., 1964-69; university librarian Yale University, 1969—. Board directors The H.W. Wilson Co., 1969—. Mem. U.S. Adv. Council Coll. Library Resources. Served with A.A.F. Air Transport Command, [illegible]

1961-66, trustee endowment fund), Association Research Libraries (dir., president 1967-68), N.Y. Library Assn., Am. Assn. U. Profs., Bibliog. Soc. Am., C. of C., Assn. Coll. and Reference Libraries, Blue Key, Kappa Delta Pi, Sigma Tau Delta, Theta Alpha Phi. Clubs: Grolier; Archons of Colophon; New York Library, Columbia U. (N.Y.C.); Cosmos, Kenwood Country (Wash.); Roxburghe (San Francisco); Book of Cal.; Yale (N.Y.). Author: Columbia Coll. Library Handbook, 1941; articles profl. jours. Home: 892 Lathrop Drive, Stanford 94305. Office: Stanford U. Libraries, Stanford, Cal. 94305.

ROGERS, Sampson, Jr., partner McMaster, Hutchinson & Co., Chgo.; dir. Avenue State Nat. Bank, Oak Park, Chmn. Midwest Stock Exchange. Home: 735 N. East Av., Oak Park, Ill. Office: 105 S. LaSalle St., Chgo.*

ROGERS, Scott Arthur, Jr., mfg. co. exec.; b. Cleve., Mar. 15, 1918; s. Scott Arthur and Alice (Roberts) R.; A.B., Dartmouth, 1940; grad. student Western Res. U., 1940-42; m. Louise G. Schickler, Sept. 15, 1943; children—Virginia Palmer, Scott Arthur III. With Parker-Hannifin Corporation, Cleve., 1948—, v.p., 1961—, pres. indsl. group, 1962—, senior vice president and member bd. dirs., 1967—. Served to capt., Tanks Corps, AUS, World War II. Decorated Bronze Star. Mem. Am. Mgmt. Assn., Fluid Power Soc., Phi Kappa Psi. Presbyn. Home: 2927 Weybridge Rd., Shaker Heights 20, 0. Office: 17325 Euclid Av., Cleve. 12.

ROGERS, Stephen, newspaper publisher; b. Lansing, Mich., Feb. 24, 1912; s. Anthony and Anna (Kruszewska) R.; A.B., Mich. State Coll., 1933; m. Athenia A. Andros, October 19, 1935; children—Stephen A., Christopher A., Elizabeth A. Began career as writer for the Detroit Times, 1934-35; copy editor N.Y. Herald-Tribune, European edit., Paris, France, 1936-37; spl. writer Newark Ledger, 1937-38; editorial writer, city editor Long Island Daily Press, 1938-41; editor Long Island Star-Jour., 1941-55; pub. Post Standard, Syracuse, N.Y., 1955-58, Herald-Journal, Herald-American, Syracuse and pres. The Herald Co., 1958—. Dir. N.Y. Dental Service Corp. (N.Y.C.). Dir. Crouse-Irving Hosp., Syracuse. Mem. New York State Publishers Associa- (pres. 1963), Am. Newspaper Pubs. Assn. Roman Catholic. Home: Duguid Rd., Fayetteville, N.Y. Office: Herald Pl., Syracuse, N.Y.

ROGERS, Thelma Tharp, mem. Republican Nat. Com.; b. Elkin, N.C., Mar. 4, 1904; d. Noah W. and Alice (Council) Tharp; ed. Winthrop Coll., Rock Hill; m. Louis G. Rogers, Oct. 14, 1924; children—Catherine (Mrs. Alexander C. Buchanan), Louis G. Active Rep. Pary, 1940—; mem. N.C. Rep. Exec. Com., 1956—; mem. Rep. Nat. Com. for N.C., 1956—. Del. White House Conf. on Aging, 1961, mem. nat. adv. com. 1959-61; asso. mem. Gov. N.C. Coordinating Com. Aging 1959-61; mem. Gov. N.C. Com. Status of Women, 1964—; mem. Nat. Com. Conv. Reform, 1966—. Methodist. Address: Route 3, Box 251, Charlotte, N.C.

ROGERS, Thomas Francis, corp. exec., physicist; b. Providence, R.I., Aug. 11, 1923; s. Thomas Francis and H. Ann (Flaharty) R.; B.Sc. cum laude, Providence Coll., 1945; M.A., Boston U., 1949; m. Estelle Elizabeth Hunt, July 6, 1946; children—Clare, Judith, Hope. Research asso. Radio Research Lab., Harvard, 1944-45; TV project engr. Bell & Howell Co., Chgo., 1945-46; electronic scientist Air Force Cambridge (Mass.) Research Center, 1946-54; asso. group leader Lincoln Lab., Mass. Inst. Tech., 1951-53; lab. head Air Force Cambridge Research Center, Bedford, Mass., 1954-59; head communications div., mem. steering com. Lincoln Lab., 1963-64; asst. dir. def. research and engring. (communication and electronics) Office Sec. Def., 1964-65, dep. dir. of research and engring. (electronics and information systems), 1965-67; director Office of Urban Technology and Research of the Office of the Secretary Housing and Urban Development, Washington, during 1967-69; v.p. urban affairs The Mitre Corp., Mass. and Va. Chairman Polaris command communications com. Dept. Navy, 1960-64; mem. panel satellite communications President's Sci. Adv. Com., 1961-63; cons. Inst. Def. Analysis, 1961-63; mem. tech. com. communications satellites Dept. Def./NASA, 1961-64; mem. U.S. nat. com. UN Conf. Application Sci. and Tech. to Lesser Developed Nations, 1963; mem. Aero. and Astronautics Coordinating Bd., 1965-67; mem. Fed. Council on Science and Tech., 1967-69. Recipient Civil Service Outstanding Performance award, 1957; Certificate Commendation, Office Sec. Navy, 1961; Meritorious Civilian Service award, Sec. Def., 1967; Constrn.'s Man of Yr. award, Engring. News Rec., 1969. Fellow I.E.E. (bd. dirs.), Phys. Soc. (Eng.); mem. Am. Phys. Soc., Am. Geophys. Union, Research Soc. Am., Internat. Sci. Radio Union (mem. nat. com. 1965). Club: Cosmos (Washington). Author articles in field. Home: Colshire Dr., McLean, Va. 22101. Office: The Mitre Corp., McLean, Va. 22101.

ROGERS, Tyrell Gibbs, stock exchange exec.; b. Trenton, N.J., Jan. 16, 1919; s. Lambert Tyrell and Dora (Gibbs) R.; A.B., Franklin and Marshall Coll., 1940; student U. Va. Law Sch., 1940-42. Asst. bus. mgr. Time Inc., 1943-48; mgr. sales control dept. Allen B. Du Mont Labs., 1948-49, exec. asst. to exec. v.p., 1949-51; bus. mgr., personnel dir. Foote, Cone & Belding, 1951-56; asst. dir. Radio Free Europe, 1956-60; v.p. N.Y. Stock Exchange, 1960—. Mem. Real Estate Bd. N.Y. Clubs: Ox Ridge Hunt (Darien, Conn.); Farmington Hunt (Charlottesville, Va.). Home: 425 E. 51st St., N.Y.C. 22. Office: 11 Wall St., N.Y.C. 5.

ROGERS, Vance Donald, univ. pres.; b. Frontenac, Minn., May 16, 1917; s. Azzy Floyd and Mary C. (Martinson) R.; student Gustavus Adolphus Coll., St. Peter, Minn., 1934-36; A.B., Hamline U., 1938; grad. student Northwestern U., 1940-41; B.D., Garrett Bibl. Inst., 1941; D.D., Neb. Wesleyan U., 1955; LL.D., Mt. Union Coll., 1958; L.H.D., Morningside Coll., 1960; Litt.D. (honorary), Lane College, 1966; L.H.D., University of Nebraska, 1968; married to Barbara Marie Yarwood, June 22, 1940; children—Nancy, Mary. Ordained to ministry Meth. Ch., 1941, minister Meth. Ch., Dundee, Ill., 1941-43, Brookfield, Ill., 1943-52, [illegible]

Mise.

Nuclear Fantasy?

Ex-Professor Siegel Claims a Breakthrough In Controlling Fusion

KMS Industries Bucks AEC In Effort to Tame Forces Of the H-Bomb for Power

'A Genius—or a Promoter'

By SETH LIPSKY
Staff Reporter of THE WALL STREET JOURNAL

ANN ARBOR, Mich.—Last June's annual meeting of fledgling KMS Industries Inc., a scientific research firm, had formally adjourned.

But nearly everybody in the small audience lingered on for a post-meeting discussion. One intent listener was an unobtrusive observer from the Atomic Energy Commission. Others were investment analysts and, of course, shareholders. They all hung spellbound on the words of a rotund former University of Michigan professor, 49-year-old Keeve M. (Kip) Siegel, KMS' founder and chairman.

Kip Siegel was talking about a nuclear breakthrough that promises "an eminent change in the condition of mankind."

It sounded like science fiction. KMS, he said, intended to harness the forces of the hydrogen bomb for peaceful purposes within five years, paving the way for a breakthrough in electrical power production through nuclear fusion. That would make possible generating plants so safe, compact and pollution-free that they could be installed in the basement of an apartment building and provide electricity for 40 blocks around.

If Kip Siegel really has what he says, he has the solutions to some problems in controlled nuclear fusion that so far have baffled the best minds in atomic energy. Whether he has is all but impossible to determine right now—partly because the AEC has locked up what Kip Siegel says are his key patent applications. But his project is important enough that top White House scientific advisers have asked for briefings on KMS and its finances.

A Tribute to Persuasiveness

That Kip Siegel could assemble an audience at all is a tribute to his persuasiveness. His laboratory is unequipped. He still is trying to line up $25 million in urgently needed start-up money. He is having trouble finding the 300 staffers he needs. The Securities and Exchange Commission is looking gimlet-eyed at his whole scheme. And past investors in Mr. Siegel's ventures have some bitter memories; prices on their shares have gone way, way up and then fallen way, way down.

Against that unpromising background, the giant First National City Bank of New York has become KMS' banker. Orville Freeman, former Secretary of Agriculture and Thomas W. Evans, a law partner at Richard M. Nixon's former firm of Mudge, Rose, Guthrie and Alexander, have become directors of the company. Bendix Corp., a large company that has done some atomic work for the government, has agreed in principle to provide some financing. And Mr. Siegel has hired away from the AEC the man who ran its research laboratory at the University of Puerto Rico.

To grasp what Mr. Siegel wants to do, a smattering of nuclear physics is instructive. The broad theory of generating power through fusion sounds simple. Small atoms, such as certain hydrogen atoms, are heated to a point where they are stripped to their basic cores, and then fuse into new and larger atoms; the fusion releases enormous amounts of heat energy that would take the place of conventional fuels. Until recently, there was only one way to generate sufficient heat to strip the hydrogen atoms—detonate an A-bomb. Now scientists can create high-enough temperatures in the laboratory, but they still don't know how to contain the stripped-down hydrogen cores so that they will fuse under control.

A "Grave Question"

Mr. Siegel thinks he has at least some of the answers. He first surfaced with his scheme in 1969, when he and Dr. Keith Bruechner, KMS' top scientific staffer and a former consultant to the government on classified fusion projects, visited the AEC and told scientists there that KMS was going to seek patents on technology involving the use of laser beams to resolve some heating and control problems in fusion.

The visit touched off a war of nerves between Mr. Siegel and the government. For one thing, AEC weapons laboratories had been working secretly for years on laser fusion. Some officials weren't sure that such work could be pursued by private scientists without the risk of compromising government weapons secrets. To some other officials and outside scientists, it also appeared that a former government consultant was mixed up with a private entrepreneur in an effort to grab exclusive rights to a potential advance the whole society should share in.

In the view of AEC Commissioner James T. Ramey, KMS "essentially stole our patents." He says that allowing any private company that relies on a former government consultant to continue such research "raises the grave question of whether individuals and organizations should be permitted to exploit for private gain what could be construed to be an 'insider role' based on past access to highly classified government data and 'know-how.'"

Mr. Siegel insists the laser approaches were Dr. Bruechner's own, not the government's, and denies they were derived from government consulting. He asserts that if patent rights can be denied on such work, scientists would no longer consult for the government.

The AEC first dealt with the problem by slapping a top-secret cover on KMS' patent applications. The agency next tried to persuade KMS to withdraw its proposal for a fusion project. But Mr. Siegel persisted, and last February the AEC agreed to allow KMS to proceed

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Nuclear Fantasy? Ex-Professor Claims Advance in Fusion Control

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with its project under a 53-month contract. At the same time, the AEC set restrictions and limits on the venture. It said it would contest any decision of the Patent Office granting KMS patent rights. It expressly stated that its contract with KMS implied no judgment that the KMS approach would work. And the contract provided no government funding.

Since then, the AEC has approved part of KMS' private financing arrangements and made it somewhat easier for KMS to hire fusion scientists. But the AEC also has moved to step up its own fusion research. That may mean more government funding of outside researchers working for the AEC, and more competition for KMS.

The AEC contract helped lure Henry Gomberg the former AEC man in Puerto Rico, to the company. Mr. Siegel's biggest coup, however, was getting Bendix to agree to join a proposed partnership with three or four other industrial corporations to kick in an estimated $50 million in research and development. Mr. Siegel is still looking for the other partners.

Bendix executives were aware of KMS' patent applications and knew some of the details. Bendix has operated an atomic facility at Kansas City, Mo., for 18 years, and its chairman, A. P. Fontaine, and one of his top scientists, had security clearances that gave them a peek at the patent applications. Moreover, Mr. Fontaine and Mr. Siegel were old buddies. When Mr. Fontaine was director of the University of Michigan's aeronautical research in the late 1940s, he lured Mr. Siegel to Ann Arbor from Rensselaer Polytechnic Institute.

Mr. Siegel's original deal with Bendix called for him to come up with the other partners by last Sept. 30 and to formally establish the partnership on Oct. 15. As a starter, the partners—except for KMS, which would have a majority partnership interest but would put up none of its own money—were to commit $25 million. The Oct. 15 deadline since has been postponed to a date in April, Mr. Siegel says. If by then Mr. Siegel hasn't found other partners, Bendix could pull out of the deal.

Selling it to other companies is a tougher thing, partly complicated by the AEC's top-secret classification on KMS' patent applications. Some companies shied away when they learned of the security dispute. Secrecy also has hindered KMS' recruiting effort. The AEC warned some scientists with recent experience in classified fusion were not to go to work for KMS, apparently to safeguard government fusion secrets. Moreover, KMS is said to have organized its research in such a rigidly compartmentalized way—only Dr. Bruechner knows the big picture—that it is uninteresting to some crack scientists who prefer to involve themselves deeply in all aspects of a problem.

Mr. Siegel concedes that he hired some "virgins," researchers without experience in fusion. Some outsiders assert that he has been forced to offer "fantastic salaries to very mediocre people."

Even with plenty of money and manpower, some skeptical experts say, Mr. Siegel can't possibly stage his demonstration in the time he says he can. One big roadblock is that KMS still has no real laboratory, just an empty shell in a research park here. One expert believes that it would take two years and $5 million just to get the lab working. Furthermore, a number of informed scientists believe that KMS so far is relying on little more than theoretical calculations—indispensable, to be sure, but not specific enough to permit speedy design and construction of a model fusion reactor.

Glenn T. Seaborg, former chairman of the AEC, is sticking to his original forecast that large electric power plants using economically feasible fusion reactors are still at least three decades away. Since James Schlesinger took over as chairman, AEC fusion scientists haven't changed their estimate that their own work still is ahead of KMS'.

Concerned over the speculative nature of KMS' project, the Securities and Exchange Commission has carefully monitored company and AEC statements to guard against an unwarranted run-up in its stock prices. After KMS' contract became public knowledge last year, the stock rose to $16.75 a share from $11 in over-the-counter trading. Since then it has dropped to below $10.

Mr. Siegel founded KMS in 1967 after making a bundle on his first venture, Conductron Corp. Started in 1960 with $12,000 in borrowed cash, Conductron grew to an enterprise with sales of about $10 million when Mr. Siegel sold out to McDonnell Aircraft Corp. (now McDonnell Douglas) six years later. He says he made $4 million in Conductron.

Things didn't go so well for Conductron after McDonnell bought Mr. Siegel's controlling interest. Mr. Siegel stayed on for a while as chairman, but he soon got into a dispute with McDonnell management, a dispute he says was centered on whether Conductron, which had been reorganized as part of a McDonnell subsidiary, should produce television sets. The company already was in radar, laser photography and other exotic specialties. According to one careful count, Mr. Siegel left McDonnell-Conductron with more than 35 Conductron people.

Meanwhile, Conductron as a McDonnell subsidiary posted a $6 million net loss in 1967, a $4.9 million loss in 1968, and a $21.2 million loss in 1969. McDonnell then stopped running Conductron as a separate entity.

While Conductron was turning sour, Mr. Siegel was on an acquisition binge at KMS. It bought more than a dozen firms in its first two years. It sold things as varied as toys and technical consulting services. The firm produced small profits in the first years, but problems arising out of its diversification dealt it a loss in 1969. The stock, once as high as $70, plummeted to $4.13 a share that year.

By 1970, KMS was caught in a liquidity crunch—as was its Detroit bank, Bank of the Commonwealth. KMS suddenly shifted gears and disposed of about 12 acquired operations in a year and a half.

Even before 1970, some insiders at KMS became unhappy. One squabble grew out of an Aug. 15, 1969, report to shareholders that a KMS technical adviser thought painted a rosier picture than was justified. The report, for example, touted "new inventions" such as ionography, an X-ray technique for use in cancer diagnosis. The technical director complained that ionography at KMS at the time was nothing more than an idea; the company had no machines, no photographs, nothing to market. He says he was "shocked" by the report, and he says it was one factor in his decision to quit the company. After leaving, he wrote the SEC to complain. Mr. Siegel now concedes the ionography announcement was premature, but he blames the incident on incorrect information he received from his scientists.

Yet at the same time KMS was in such ferment, Mr. Siegel was preparing for his bold venture into fusion. Says one investor who has followed Mr. Siegel's career closely: "He's either a genius—or a promoter."

world. He has applied his scientific knowledge of economic geology to mineral and mineral fuel resource studies which have led to his recognition as a key figure in the development of national policies on mineral and energy resources.

● **Irene Parsons**, Assistant Administrator for Personnel, Veterans Administration, for her fair-handed leadership during major agency reorganizations and for enhancing equal opportunities for minorities, women, and the handicapped. She has been in Government service for 26 years. According to VA Administrator Don Johnson, Miss Parsons "has established for the VA a position of leadership among Government agencies in the public policy programs of the President."

● **Dr. Fred L. Whipple**, Director, Astrophysical Observatory, Smithsonian Institution, for outstanding scientific contributions as builder and director of the Smithsonian's astrophysical laboratory and for contributions to space and defense research. He has been with the Smithsonian since 1955. He is also professor of astronomy at Harvard University.

Dr. Fred L. Whipple

Charles F. Wilson

Dr. Laurence N. Woodworth

● **Charles F. Wilson,** Chief, Conciliations Division, Equal Employment Opportunity Commission, for his skillful negotiations with large corporations and unions to halt discrimination and increase job opportunities for minorities and women. On the job over 10 years, Wilson, a Marine in WW II, was instrumental in the establishment of the first law school in Florida that would admit Negro students. In Florida, also, he was the first member of his race to practice law in Pensacola and the first Negro attorney in the Attorney General's office.

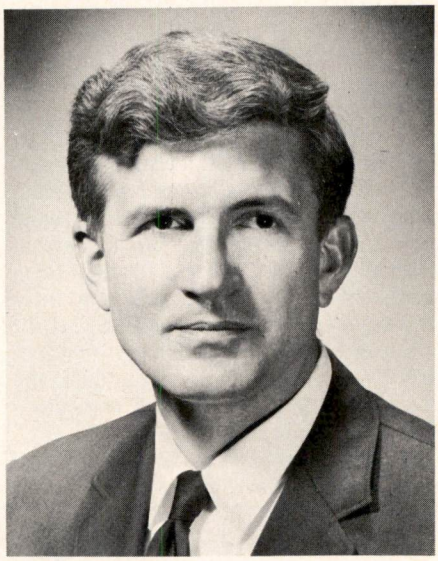
● **Dr. Laurence N. Woodworth**, Chief of Staff, Joint Committee on Internal Revenue taxation, U.S. Congress, for his expertise and social conscience in formulation of intricate tax laws such as the Revenue Acts of 1962 and 1964 and the Tax Reform Act of 1969. He has been on the staff of the committee since 1944.

In supporting Woodworth's nomination for the award, Rep. Wilbur D. Mills (D-Ark.), Chairman of the Ways and Means Committee and of the Joint Committee on Internal Revenue Taxation, said: "His expertise has been such that the accomplishments of the Congress in tax reform would have been virtually impossible had it not been available."

Awards for Special Achievement:

● **Dr. Daniel V. DeSimone**, Office of Invention and Innovation, Institute for Applied Technology, National Bureau of Standards, Department of Commerce, for his leadership on the landmark metric system conversion study. Nine years at NBS, DeSimone is a recognized authority on technological innovation, invention and patents. In 1970 he received the highest award the Commerce Department can bestow—the Gold Medal for Outstanding Service. (DeSimone is now assistant to President Nixon's science advisor.)

● **Clifford D. May, Jr.**, Deputy Manager, National Communications System, Defense Communications Agency, Department of Defense, for his major role in the 1963 "hot line" agreement with the Soviet Union, and for leading the U.S. team in a recent SALT (Strategic Arms Limitation Talks) agreement to improve the DCL (Direct Communications Link) between the two countries. May has been in Government service for 26 years.



Dr. Daniel V. DeSimone

Clifford D. May, Jr.

FINANCE

INVESTMENTS

Fischer's Forecast

By PAT FISCHER
Hornblower, Weeks,
Hemphill & Noyes

[A combination of three key trends has caused us to start this column: (1) with Federal spending accounting for some 22 percent of the Nation's Gross National Product (GNP), where Washington intends to spend those funds will have an unparalleled influence over where economic growth in the Nation is most likely to occur; (2) the present Administration clearly intends to exercise that leverage over the economy; (3) most readers of Government Executive *are in an income bracket where you, personally, could profit from expert advice on how to translate those general trends into specific stock purchases.*

[To avoid potential conflict-of-interest problems, for ourselves as well as you, we've gone to an independent source for this analysis. Little known outside the investment fraternity, but highly regarded within it for his expertise, Fischer, in this first article, lays the groundwork for specific trend-comments he will be presenting on this page in each of the magazine's future monthly issues.]

THE SPEEDED-UP TEMPO of President Nixon's economic game plan, (first wage-price, parts of which were announced last August) are somewhat like the kind of offense a football team would move into in the last two minutes of an otherwise losing-game effort. Whether he has started his "two-minute drill" early enough to stimulate the economy and thus, aid his re-election this Fall is one thing.

But for stock market investors—if they choose their investment targets wisely—the fact that he's started at all means 1972-73 ought to be good investment years. Main reason: his economic moves are supported by some hard, real events which will occur in the next decade and are, from an investment standpoint, very encouraging.

That, in turn, is reinforced by the simple fact that Government economic programs simply can't be turned around on a dime, whether he is re-elected or not. Thus, no matter who is elected in November 1972, the best advice for investors is, "Don't fight the trend," at least not within the timeframe noted above.

Besides the Phase I-Phase II wage-price controls, most public attention has been given to a third part of the "game plan," i.e. releasing the dollar from the gold standard and letting it seek its own level in relation to foreign currency. This international monetary crisis was brought on by a U.S. deficit balance-of-payment situation which increased our short-term liabilities overseas.

That, in turn, aggravated our domestic money problems, e.g. inflation, higher interest rates, etc. Foreign trade currently represents only five percent of U.S. GNP. To allow this to dictate our national economic goals, as press publicity suggests it is, seems like allowing the tail to wag the dog.

For the real results of inflation, etc., are declining business activity, soaring savings rates. And, it seems evident, Nixon's game plan calls for reversing both those past trends in a hurry. While the Federal Government has been notoriously ineffective in its efforts to harmonize fiscal and monetary policy, President Nixon's recent efforts, hopefully, will arrest inflation (this country's biggest bandit), stabilize prices and rejuvenate economic activity.

They should, almost certainly in the long term if not the short term. Stock market attempts to forecast future earnings of the American industrial complex are not errorless. But they can hardly miss observing significant changes taking place in the age groups which make up our population.

By 1980, the U.S. will have a population of 228 million persons, most of the increase coming in the 18 to 35 age category. That latter group will control nearly 40 percent of the Nation's disposable income. They will be better educated, demanding higher quality products and services, be more receptive to new products, and will spend more money, in many cases more than their income, using credit to fill the gap.

The natural consequence of two million persons reaching 21 years of age each year is that we can expect a higher rate of marriages, new families and new offspring. Though it is believed they will follow a trend of fewer babies per family than their grandparents had, they will travel more, enjoy more of the leisure hours our high-technology economy has provided. With fewer children, they will have more time and money to pursue their desired standards of living.

And it is during those early years of family formation that long term monetary commitments are made, creating a greater demand for: housing, autos, appliances, furniture, carpeting, etc. For these young men and women to earn and control 40 percent of U.S. disposable income—in effect, for them to create that demand, means they must be employed.

Whatever their motive, political or otherwise, Government (with autonomous control over nearly one-fourth the GNP) clearly intends to stimulate the business activity to take care of that employment challenge. Reaching the goals will not be easy. Example: while the Nation's population growth will drop from 1.4 percent in the last decade to 1.2 percent in the next, the labor force will jump from 1.5 percent to 1.7 percent, an increase of 15 million employable persons by 1977.

To fully employ them, large additions to plant and equipment will be required. Business spending per employee has increased at a 2.8 percent rate for the last few years, in terms of 1958-dollar purchasing power. With increased product demand, favorable in-