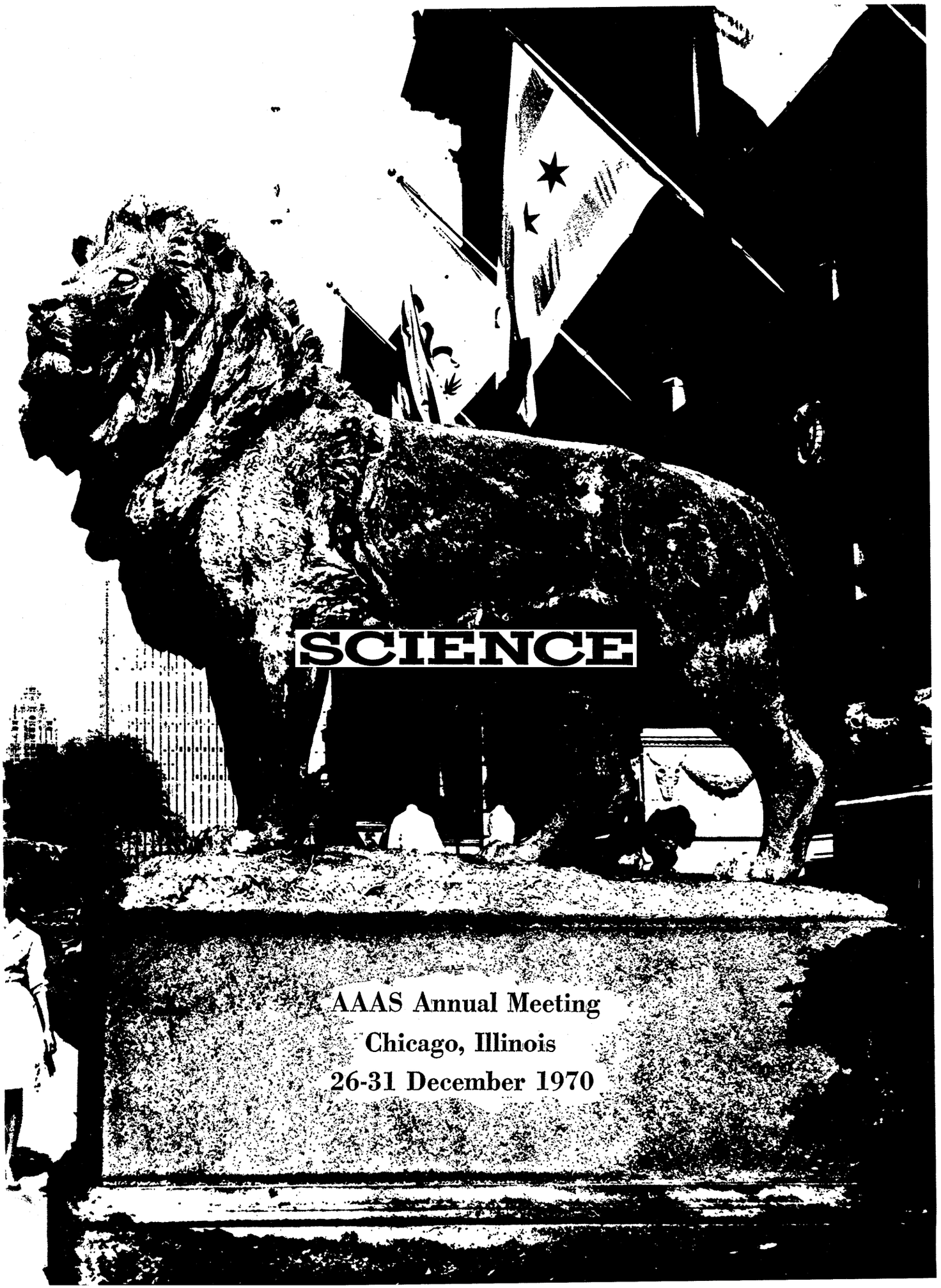

SCIENCE
AAAS Annual Meeting
Chicago, Illinois
26-31 December 1970

A Brief Guide to the 1970 AAAS Annual Meeting

Walter G. Berl, *Meeting Editor*

It is thus clear that the AAAS should not attempt to hold to a pattern of annual meetings that was natural and effective many years ago, but which is now outmoded . . . [but] devote more of its energies to broad problems that involve the whole of science, the relations of science to government, and indeed the relation of science to our society as a whole. . . .

This year's meeting very nearly reaches the goals framed as long ago as in the 1951 Arden House Statement and pursued, at an accelerating pace, since 1967. A large part is devoted to an "Annual Report" on the state of science, its successes, and its concerns. In its technical content many topics are discussed on various levels of complexity. A substantial number of the lectures and symposia will be of interest to the lay public, to students, and to professionals who are interested in the broad problems in which science has entered everyday life. In addition, several topics of current interest are discussed at length and in considerable depth, parts of which should be readily accessible to interested "outsiders" whose participation and views will be welcomed. Finally, a substantial number of symposia deal with scientific topics where good progress has recently been made and which will have an impact on the direction of research in the years ahead.

This rich fare is supplemented by several other important features. Young people are organizing sessions of their own choosing in which they intend to query their elders on matters that concern them deeply. On a different level and appealing to different senses, many films relating to science will be shown. Six Illustrated and Demonstration Lectures will be given. Of particular interest is a presentation of Lord Kenneth Clark's "Civilisation" (three times daily in its entirety of 13 parts) in such a way that its superb imagery will be seen to best advantage.

During the week of the AAAS Meeting a number of cultural institutions in Chicago will present exhibits, in part specifically organized for the AAAS, in part in harmony with topics discussed at the Meeting. The Museum of Contemporary Arts is exhibiting "The Architectural Vision of Paolo Soleri" and he will participate in two symposia (*Urbanization in the Arid Lands* and *World Cities of the Future*). The Illinois Institute of Technology has two exhibits ("Desert and Mountain Cities" and "City and Regional Planning") that are concerned with the same themes. The John Crerar Library and the Chicago Historical Society are presenting exhibits on "The Contribution of Women to Science" and "The Great Chicago Fire," two topics that are being discussed at the meeting. Leonardo da Vinci models based on the Madrid manuscripts will be shown at the Museum of Science and Technology, while the Art Institute of Chicago has a major showing of the French artist and city planner Jean Dubuffet.

Registrants at the meeting will have an opportunity to visit a large number of laboratories and industrial plants in the Chicago area that are not normally open to visitors: The Sonia Shankman Orthogenic School of Dr. Bruno Bettelheim at the University of Chicago; the laboratories of Professor Humberto Fernandez-Moran and of Professor Albert Crewe at the University of Chicago. Tours will visit the National Accelerator Laboratory, the Oriental Institute Museum, the Dresden Nuclear Power Station, the huge sewage treatment and disposal plant of the City of Chicago, and other interesting places. Visits are being arranged to look at some of the concerted efforts of the City of Chicago to preserve its history and at some of the adjustments to the realities of the day. In this way many matters raised at the meeting will be graphically illustrated in full scale. (A complete listing of tours was published in *Science*, 23 October 1970.)

Whether as much of the program will be televised for a national audience as has been customary in recent years is not clear at this time. The presentation of five 1-hour evening programs seems assured. However, the financial stringencies of the present may preclude the more liberal efforts of the past several years. But close to 30 of the most interesting symposia and discussions will be audiotaped and made available for sale, probably within a month after the meeting. A detailed announcement on this will appear in *Science* in the near future.

All these events must, per force, be crowded into a span of 4½ days. This requires, alas, great selectivity by the participants. But as an opportunity to participate in the public discussions of important issues, to observe people in action who care deeply about ideas, their clarification, and their application, the AAAS Annual Meeting is unique. It is dedicated more than ever to "increasing public understanding and appreciation of the importance and promise of the methods of science in human progress," a concept central to the purpose and objectives of the AAAS.

AAAS INVITED LECTURES AND ILLUSTRATED LECTURES

Special Lecture I (26 Dec.)

Speaker: Philip Handler (President, National Academy of Sciences).

Obligations to the Scientific Community.

Demonstration Lecture (27 Dec.)

Speaker: Eric M. Rogers (Professor of Physics, Princeton University).

Measuring Air Molecules (Why should people believe what scientists tell them about molecules and atoms?).

This lecture will consist of a series of demonstration experiments, accompanied by a discussion of the way in which these provide information about molecules, or at least support our theoretical structure of knowledge.

Demonstrations will show measurements of air pressure and air density; the theoretical deduction from those will be illustrated by a demonstration with a real gas. Liquid nitrogen will be used to show the existence of molecular forces and then to provide an estimate of the spacing of molecules in ordinary air. An experiment with visible gas will lead to an estimate of collision distance and size of air molecules.

Other experiments will be shown if time permits. This is offered as a popular lecture of demonstration experiments for a general scientific audience.

Special Lecture II (27 Dec.)

Speaker: Natalia Sergeevna Kisljak (Director, Clinic of Childhood Diseases of the Second Moscow Medical Institute (Pirogov) and First Deputy Minister of Health of the Russian Soviet Federal Socialist Republic).

Role of Soviet Women in the Development of Science.

Distinguished Lecture (27 Dec.)

Speaker: Gunnar Myrdal (Director, Institute for International Economic Studies, Stockholm, Sweden).

The Strategic Role of Science and Technology in the Development of Underdeveloped Countries.

Address of the Retiring President (28 Dec.)

Speaker: H. Bentley Glass (Academic Vice President, State University of New York, Stony Brook).

Science: Endless Frontier or Golden Age?

The Scientific Research Society of America (RESA) Annual Address and Procter Prize (29 Dec.)

Speaker: Lloyd M. Cooke (Director of Urban Affairs, Union Carbide Corporation, New York City).

Scientific Societies and the Government—Their Mutual Aid in Environmental Improvements.

Special Lecture III (29 Dec.)

Speaker: Vadim Sergeevich Semenov (Member of Presidium of the Soviet Sociology Association, Moscow).

Lenin's Scientific Predictions and the Extent of Their Realizations Today.

Sigma Xi–Phi Beta Kappa Lecture (29 Dec.)

Speaker: Allan Cartter (Chancellor and Executive Vice President, New York University).

All Sail No Anchor.

Frontiers of Science Lecture (30 Dec.)

Speaker: Thomas Eisner (Professor of Biological Sciences, Cornell University).

Better Living Through Chemistry—Insect Style.

Insects are among the most versatile of chemists, and they depend on this versatility for survival. Through chemistry they lure their mates, they detect their foods, and they protect themselves from enemies. To study them is to understand them (and to love them) and to learn what the chemistry of natural products is all about.

Illustrated Lecture I (26 Dec.)

Speaker: Margaret Mead (Curator Emeritus, The American Museum of Natural History and Adjunct Professor of Anthropology, Columbia University).

Primitive Life Styles; Once Lost, Irretrievably Lost.

This lecture will illustrate the kinds of materials which it is now possible to preserve, both as a heritage of the primitive peoples who are leaving their past behind them, but may want access to it again, and as a contribution to the knowledge of the whole world on human possibilities. In the past, only stone survived; today we can preserve the delicacy of gesture and intonation, and even see, when he himself points the camera, what primitive man saw in the world around him.

Illustrated Lecture II (27 Dec.)

Speaker: Asen Balikci (Professor of Anthropology, University of Montreal).

The Netsilik Eskimos in May 1970.

The Arviligjuarmiut are a branch of the Netsilik Eskimos living along the arctic coast of Canada. Their traditional habitat is Pelly Bay, an ice-locked arm of the sea. Due to their extremely isolated location these Eskimos were able to preserve most of their ancient ways until very recent times. Hunting caribou at the crossing places, fishing salmon trout with spears, and harpooning seals were their main subsistence activities. In winter they built igloos and drove skin sledges. In summer they ceaselessly roamed over the marshy tundra in constant search for game.

The annual migration cycle of these Eskimos was re-

corded on film in 1963 and 1965. During our filming expeditions we were conscious of preserving for posterity a unique and highly original mode of existence. Soon after the completion of our field work drastic transformations took place at Pelly Bay. As a result of the construction of new frame houses for the families, a school and a new church, a general store, and a community hall, a new settlement pattern was established in the area. This form of imported civilization, almost entirely sponsored by the federal government, is faithfully described in this new film made by the National Film Board of Canada.

Illustrated Lecture III (27 Dec.)

Speaker: Paul S. Bauer (Captain, U.S.N.R. [ret.], Washington, D.C.).

An Active Volcano in Evolution.

On 14 November 1963, a marine volcano came to the surface on the southwest coast of Iceland. This eruption, which lasted until June of 1967, created for the first time in the history of man a shield volcano of the Hawaiian type. The eruption has been analyzed from a point of view of phenomena, with no time sequence in the eruption cycle. This lecture will illustrate such phenomena as: How does a volcano come out of the sea? How do the explosions change to lava flow? How is a lava lake and a caldera formed? What are the different types of lava and what is the reaction when the lava hits the sea?

Illustrated Lecture IV (28 Dec.)

Speaker: William H. Pickering (Director, Jet Propulsion Laboratory, California Institute of Technology).

Exploration of Mars.

The planet Mars has aroused much speculation since Cassini first sketched the polar caps in 1696 and Schiaparelli described his "canali" in 1877. Early in this century, Percival Lowell saw these markings as irrigation canals for carrying water from the melting polar ice and many romanticists pictured the reddish planet as the home of elaborate cultures, complete with cities and other civilized artifacts.

Exploration of Mars with automated spacecraft began with Mariner 4 in 1965, which gathered valuable pictorial and instrumentation data. Mariners 6 and 7 flew within about 2100 miles of the surface in summer 1969. The 200 pictures showed a heavily cratered, lunar-like surface, a strangely featureless region in the desert Hellas, and a wildly jumbled and chaotic area of "slumped" terrain. Lowell's canals seemed to resolve into chains of craters. The polar caps apparently showed characteristics of frozen carbon dioxide. No definite "wave of darkening" could be identified. The atmosphere, mostly carbon dioxide, revealed traces of water vapor, no nitrogen; the surface pressure was only a fraction of Earth's. Evidence of an ionosphere was found above 80 miles.

It is not likely that the controversy over the existence of life on Mars can be finally resolved except by conducting biological experiments on the surface. The evidence of the Mariners has yielded no indication of life forms, nor does it exclude that possibility. The thin atmosphere, wide temperature excursion, direct exposure to solar radiation, and apparent lack of readily available surface water would seem to inhibit the presence of life as we know it. However, the twin Mariner orbiters of 1971 and the Viking orbiter-landers of 1975 will provide data that could answer many of these questions, and open the pathway to eventual manned exploration of the mystery planet.

Illustrated Lecture V (29 Dec.)

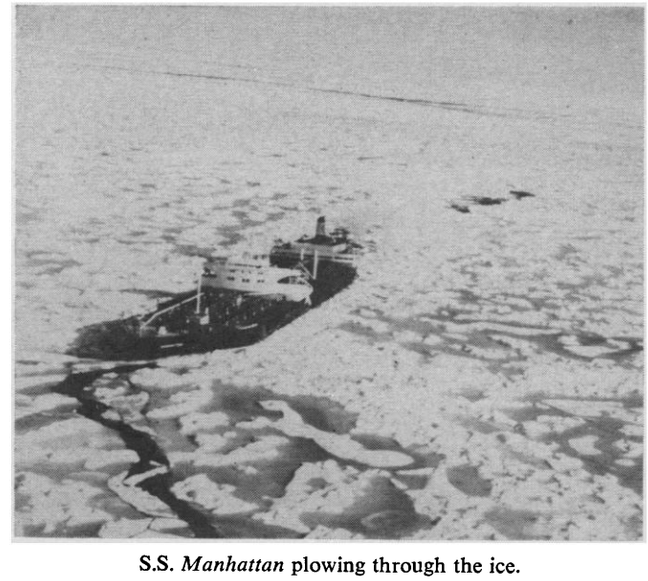
Speaker: Stanley B. Haas (Assistant Operations Manager, Marine Department, Humble Oil & Refining Co., Houston).

Northwest Passage Test.

Humble Oil & Refining Company equipped the S.S. *Manhattan* as an Arctic test ship and conducted test voyages in the Canadian Archipelago and Arctic Alaska during the fall of 1969 and spring of 1970 with the object of studying the feasibility of commercial year-round Arctic shipping.

Plans for the tests were developed with the assistance of the Canadian Department of Transport, the U.S. Coast Guard, the Cold Regions Research and Engineering Laboratory, the U.S. Navy and other Arctic scientists and engineers from the United States, Great Britain, Finland and Canada. In addition to the challenges of equipping the largest ship in the U.S. flag fleet as an Arctic test vehicle, plans were also developed to cope with Arctic communications and navigation problems, measuring ship performance, testing the physical properties of the ice, conducting reconnaissance ahead of the vessel and handling the logistical needs of the *Manhattan* and icebreaker escort vessels.

The experiences encountered were often quite different than anticipated. The knowledge gained permits a better understanding of the problems associated with shipping operations in the Arctic. The data gathered will also better equip future designers in providing facilities which are safer—both for the ship and the environment.



S.S. *Manhattan* plowing through the ice.

Illustrated Lecture VI (30 Dec.)

Speaker: Eugenie Clark (Associate Professor of Zoology, University of Maryland).

The Lady and the Sharks.

This lecture illustrates how scientists work in the field and laboratory, using sharks as experimental animals. The Mote Marine Laboratory (formerly the Cape Haze Marine Laboratory) is one of the world's few shark research centers. It is located on the west coast of Florida, where marine biologists, parasitologists, endocrinologists and medical research investigators have been working in teams since 1955, studying the behavior, morphology, ecology, and medical uses of 18 species of littoral sharks. A film shows how sharks, particularly the common circumtropical tiger shark, are caught, dissected, and used in research, and how young sharks are born.

AAAS COMMISSION AND COMMITTEE SYMPOSIA

Reducing the Environmental Impact of a Growing Population (26–30 Dec.)

Arranged by S. Fred Singer and J. Ernest Dunwoody.

A better population distribution is an essential factor in reducing the environmental impact of a population which is growing and becoming more affluent. The basic strategies include settling sparsely populated rural areas, fostering growth of small towns outside metropolitan regions, and building new cities. These approaches are not mutually exclusive and will probably go forward at the same time. They all pose difficult problems and challenging opportunities—in technical and social innovation, in economics, and in governmental action. In recent reports the Council on Environmental Quality and the White House National Goals Research Staff have drawn attention to this subject and have raised far-reaching questions, many of which will be discussed by the invited panelists.

Carl L. Klein, Robert B. Dean, Vinton W. Bacon, Sam E. Beall, Jr., Robert N. Rickles, Richard D. Vaughan, Harry Perry, J. Ernest Dunwoody, John Fisher, James Hunt, Alan Sweezy, Gordon Yaswen, Cliff Humphreys, John Kratilla, Walter Hamilton, Jerry Meral, C. Hurst, Jr., Michael Perelman, Hugh Folk, Boyd Keenan, Jane Westernberger, Paul McCloskey, Mike Sweeney, Athelstan F. Spilhaus, Harold Finger, Dorn McGrath, Jr., Sumner Myers, William Wheaton, Adam Yarmolinsky, Daniel P. Moynihan, Bertram Gross, S. Fred Singer, Philip Hauser, Herber Locke, Margaret Mead, Peter A. Morrison, Kenneth E. Boulding, Anthony Downs, Karl A. Fox, Norman Jones, Joseph Kanter, Manfred Kochen, William Lear, Robert Cahn, Richard Babcock, Orme Lewis, Jr., William J. Nicoson, John Price, William Slayton, and Stewart Udall.

Urbanization in the Arid Lands (26–27 Dec.)

Arranged by Carle O. Hodge and Carl N. Hodges.

Two of civilization's earliest cities were in the desert. Eridu and Kish thrived five millennia ago in the irrigated valleys of Mesopotamia. Eventually, though, their canals filled with silt. There was drought, and the cities were abandoned. Modern technology has made arid areas more habitable and less remote. In the United States, indeed, the region of greatest population growth during the past two decades has been the arid West. Studies have shown that urbanization, with light industry, utilizes the sparse water of the West more profitably than does agriculture. Nonetheless, such fundamental questions as whether man should adapt his development to the arid environment, rather than seek to modify the environment, never have been resolved. These matters will become increasingly significant as the burgeoning world population leads, as it surely must, to accelerated settlement of the vast land bank that is the dry fifth of the earth. In that context, then, this symposium will examine the natural and cultural constraints on such settlement, reflect upon past failures and successes in inhabiting the deserts and semideserts and, finally, assess means by which urbanization in the arid lands might evolve more logically.

William E. Benson, Marion Clawson, E. Y. Kedar, Sol D. Resnick, Kenneth J. DeCook, Herman Bouwer, J. C. Lance, George B. Maxey, Gilbert F. Cochran, Heinz H. Lettau, Aristide H. Esser, Courtland L. Smith, Andrew W. Wilson, Charles E. Campbell, Lay James Gibson, Richard F. Logan, Gerry A. Hale, George B. Happ, Wade H. Andrews, William Weismantel, Howard J. Nelson, Bryon L. Johnson, Paolo Soleri, and Gilbert F. White.

Is Population Growth Responsible for the Environmental Crisis in the United States? (27 Dec.)

Arranged by Michael W. Corr.

There is at this time a sharp difference of opinion, within the scientific community, regarding the need to take immediate steps to halt the growth of the U.S. population. Apart from value judgments as to the population level which one finds personally preferable, this issue involves divergent interpretations of the relevant scientific data. It is this divergence which is the subject of the symposium. The symposium will be in the general form of a debate; each speaker will present his own views in a brief introductory statement, following with a discussion of questions posed to the speakers by the audience.

George Wald, Ansley Coale, Barry Commoner, Paul Ehrlich, and Garrett Hardin.

Science Education in the Seventies (29 Dec.)

Arranged by John R. Mayor and Arthur Livermore.

Much progress has been made in the improvement of science education in the past decade, but the needs and problems of the coming decade will almost certainly bring about major changes in the pattern of education in the Seventies, affecting the role of administrators, teachers, and pupils, and the nature of teaching materials at all levels and in all disciplines. Current widespread concern about science and society may impose special problems in science education. Each speaker has been invited to present a plan for science education of the seventies which may involve drastic revision of present school practices. It is not expected that the speakers will be in agreement about their ideas of what science education should be, because of their varied backgrounds of experience and special interests.

The symposium is planned for scientists and for those who are active participants as teachers, administrators, and advisors in school science programs. The papers to be presented will have wide interdisciplinary interest and interest for both school and college personnel.

An important part of the efforts of the AAAS Commission on Science Education in the next year will be devoted to a study of the needs in science education in the next

decade. This symposium represents one of the ways in which the Commission seeks the assistance of the scientific community in exploring what is needed in science education and how what is needed can be obtained.

Fred S. Keller, John A. Moore, Clifford Swartz, and Robert B. Livingston.

GENERAL SCIENCE SYMPOSIA

Is There a Generation Gap in Science? (27 Dec.)

Arranged by Aristide H. Esser and Virginia R. Hannon.

Present-day concern with the "generation gap" between youth and their elders has helped to give new dimensions to the breakdown in communication which exists between other elements in society, and whose manifestations may be seen in campus unrest, rioting in urban ghettos and antiwar demonstrations. The symposium will deal with the effects of this polarization on science, and with related issues of the accountability of the scientist, the imposition of political and social controls on scientific research and teaching, and the participation of the consumer in setting scientific policy.

The symposium will provide an opportunity for a free exchange of opinion on the part of some of the embattled elements. The past fifty years of scientific endeavor will be placed in historical perspective by spokesmen who were outstandingly identified with science in the pre-World War II era, during and immediately following World War II and in the post-Sputnik era. A student spokesman who is about to enter scientific training will allow for projection of discussion into the immediate future. The presentations of speakers will cover what science saw to be its role and responsibility in past years, and will point up stages in the development of the present conflict. Invited discussants will offer comments on the issues raised. In the evening there will be small, informal "rap" sessions for guided discussion of issues to allow maximum opportunity for an exchange of opinion between *all* interested parties.

Margaret Mead, Albert Szent-Gyorgi, Edward Teller, Richard Novick, Frederic Commoner, and Nancy Hicks.

Responsibilities of the Scientist (27 Dec.)

Arranged by Steven Orman.

Techniques and Status of Modern Parapsychology (27 Dec.)

Arranged by Robert Van de Castle and Douglas Dean.

The symposium will give an introduction to the historical evolution of the field of parapsychology as a scientific discipline. Stress will be placed on the interdisciplinary character of the research. There will be a brief survey of traditional methods and means of evaluation, as for example, assessment of verbal material, results in altered states of consciousness, use of instrumented methods and statistical analysis.

After the introductory speakers there will be a panel of representatives of seven of the ten or so centers of parapsychological research in North America. Each representative will give a brief summary of research at his center. Topics to be covered, among others, will be high-scoring subjects, applications, effects of distance, dream studies, personality patterns, anomalies in quantum theory, possibilities of developing psychokinetic theory. The material to be presented should have wide interdisciplinary interest for psychologists, psychiatrists, biologists, and also physicists.

Gardner Murphy, Robert Van de Castle, Gaither Pratt, Douglas Dean, Karlis Osis, Charles Honorton, Gertrude Schmeidler, Helmut Schmidt, and Robert Morris.

Women in Science (27 Dec.)

Arranged by Jean E. Simmons.

Role of the Soviet Women in the Development of Science.

At a time when attention is focused on women's rights and on the roles of women in American society, and at the particular time when AAAS has its first woman president, it is appropriate that Sigma Delta Epsilon, organization of graduate women in science and an affiliate of AAAS, sponsor a symposium on Women in Science. This symposium considers in broad spectrum what women have accomplished in the past in science; what they are doing currently; what is the potential and what the future of women in science. Imposed limitations on their roles, direct and indirect, are discussed, and insights sought from psychology and anthropology. A range of opinions is tapped: from different age groups, from both sexes, from different fields of the sciences, from varied backgrounds of achievement, from different geographical origins and from a spread of political outlook.

Jean E. Simmons, Ruth Hubbard, Jeanette R. Piccard, Christina Vander Wende, Deborah P. Wolfe, Lois K. Miller, Arie Y. Lewin, Mary I. Bunting, Anthony Leeds, Mina S. Rees, Naomi Weisstein, and Natalia S. Kisljak.

Mood, Behavior, and Drugs (27–28 Dec.)

Arranged by Chauncey D. Leake.

This symposium will explore biochemical, pharmacological, psychological and social factors relating to drug abuse. The significance of the sense of satisfaction in mood and behavior will be considered in regard to the psychodynamism of dissatisfaction. A sense of satisfaction may be obtained under varying conditions of mood by drugs which may stimulate, depress or disorganize brain function. Individual and social conditioning plays a major role in behavior in relation to drug abuse. Wise public policy on drug abuse should take into account current scientific studies on these matters.

Chauncey D. Leake, Richard Horman, Allan M. Fox, Roswell Johnson, Edwin Lipinski, Theodore Rothman, H. W. Elliott, Joel Elkes, Frank Berger, Roland Fischer, Samuel C. Kaim, Edward Truitt, E. Barratt, Harold Goolishian, Gene Samuelson, Robert White, Harold Himwich, David E. Smith, Elton McCawley, Alexander Karczmar, Hector Sabelli, E. Leong Way, Jean Paul Smith, Daniel Efron, Nathan Kline, Henry Wisniewski, R. D. Terry, Frederick K. Goodwin, Leo Hollister, Larry Stein, Sidney Cohen, and Joel Fort.

Public Policy for the Environment (28 Dec.)

Arranged by Harold P. Green and Walter G. Berl.

This panel will consider the broad scope of environmental problems from their basic causes to their consequences, the various techniques of public control which

might be employed to maintain environmental quality, and the priorities to be given solutions to environmental problems relative to other major national problems.

Milton Kaplan, Barry Commoner, Pierre Dansereau, David B. Cavers, and Robert U. Ayres.

Science and the Federal Government—1970 (28–30 Dec.)

Arranged by Raymond J. Seeger.

The year 1970 marks the 25th anniversary of the epoch-making report on "Science, the Endless Frontier" and the 20th anniversary of its partial implementation in the establishment of the National Science Foundation. The Symposium on "Science and the Federal Government—1970" commemorates these two events. The first session, "In Retrospect," involves some of the key people who participated in guiding the national policy of science during the past quarter of a century; the last session, "Outlooks," involves leaders of government agencies responsible for current scientific activities. In addition, there are four round-table discussions on significant problems of federal science today. In each case, there is an introductory presentation of critical concerns by a person with government experience, and then a discussion by individuals selected from industry, education, and the federal government. There are also two open Forums at which time representatives of federal agencies will answer questions relating to the federal support of (1) libraries and (2) scientific research. Several government agencies have compiled lists of specific memorable scientific activities of their own for the period 1945–1970.

Cyril S. Smith, John W. Davis, Detlev Bronk, James R. Killian, Jr., George E. Lindsay, S. Dillon Ripley, Curtis G. Benjamin, Bowen C. Dees, David M. Gates, James B. Griffin, H. William Koch, Marvin W. McFarland, Alan McGowan, John H. Moriarty, Froelich Rainey, Charles W. Schilling, E. Leland Webber, Donald Wright, Robert R. Kepple, F. Kurt Cylke, Elsa S. Freeman, Madeline Henderson, Burton Lamkin, Mina Rees, Leland Haworth, Donald W. Aitken, Herman Branson, D. Allan Bromley, Harold G. Cassidy, Vera Ferris, Paul Heltne, J. Herbert Hollomon, Charles V. Kidd, David D. McFarland, Rodney W. Nichols, William G. Pollard, William J. Price, Frederick E. Terman, Ernst Weber, Charles Ruttenberg, Alvin M. Weinberg, James A. Shannon, Allen V. Astin, Lewis M. Branscomb, Robert C. Charpie, Milan D. Fiske, Robert A. Frosch, E. M. Glass, W. E. Hanford, Gregory Hartmann, John C. Johnson, J. Ross MacDonald, Nicholas U. Mayall, W. H. Pickering, Warren Washington, F. Joachim Weyl, James Goldman, H. Bentley Glass, Vadim Sergeevich Semenov, Robert Q. Marston, N. D. Bayley, Spofford G. English, Daniel R. Miller, Francis B. Smith, Edward P. Todd, Gerard Piel, Herman Pollack, Bart Bok, Harrison Brown, A. M. Clogston, Andre Cournand, Sherwood L. Fawcett, Richard L. Haedrich, William L. Lehmann, Frank A. Long, Robert Marshak, James Murray Luck, Thomas B. Owen, Bruce S. Old, Edgar L. Piret, Roger Revelle, Ragnar Rollefson, John Townsend, Neil Carothers III, Raymond J. Seeger, Charles A. Mosher, Vernon E. Wilson, Homer E. Newell, William D. McElroy, and Glenn T. Seaborg.

The Law-Science Interface (29 Dec.)

Arranged by Harold P. Green and Eugene Skolnikoff.

This will be an unstructured discussion among two law teachers and two natural scientists, moderated by a political scientist with long involvement in public policy for science and technology. It will focus on the lawyers' perceptions of science and scientists and the scientists' perception of the law and lawyers, particularly as these perceptions relate to science policy consideration.

Eugene Skolnikoff, Herbert G. Vaughan, Franklin A. Long, John G. Palfrey, Carl Auerbach, and Henry Luce.

Technology: Nuts and Bolts or Social Process? (29–30 Dec.)

Arranged by Thomas R. DeGregori.

Anthony Leeds, Thomas R. DeGregori, James Boggs, Gene Walsh, Clinton Jencks, Milton D. Lower, W. Paul Strassman, Eugene Ferguson, Richard Woodbury, Louis J. Junker, Cyril Stanley Smith, Thomas Esper, Gerard Piel, Barry Commoner, George Basalla, Paul Sears, James Blaut, and David B. Hamilton.

The Effects of the Large-Scale Use of Herbicides and Defoliants (29 Dec.)

Arranged by Matthew S. Meselson, Herbert Scoville, Jr., and Walter G. Berl.

In 1967 the AAAS Council asked for an inquiry into the large-scale use of herbicides and defoliants in Vietnam, and of their potential deleterious long-range effects. In response to this request the AAAS Board of Directors appointed Professor Matthew S. Meselon (Harvard University) to undertake such an investigation and to make his findings available to the Board of Directors in early December 1970 and to the Council at the Annual Meeting of the AAAS in Chicago. The symposium will include reports on the findings and conclusions of the group that, under Professor M. Meselson's direction, visited South Vietnam during the fall of 1970. In a separate Panel Session the wider implications of the large-scale use of defoliant chemicals will be discussed.

Kenneth Thimann, H. Bentley Glass, Matthew S. Meselson, A. H. Westing, J. D. Constable, Herbert Scoville, Jr., George Bunn, William Stone, Samuel Popkin, Richard R. McCarthy, and Fred Tschirley.

Science and Human Needs (29 Dec.)

Arranged by George Wald.

At AAAS Meetings scientists have frequently tried to tell laymen and the general public what their views are and what science has to say that is of general interest. Perhaps the time has come to offer an opportunity to laymen—or some of their representatives—to tell scientists what they want of them. That is the purpose of this meeting.

Leonard Woodcock, George Wiley, George Wald, John Froines, and Pete Seeger.

Crime, Violence, and Social Control (29–30 Dec.)

Arranged by Joseph F. Coates and Arnold Sagalyn.

The present state of knowledge with regard to the causes and manifestations of violence and crime, and the social and institutional mechanisms for their control and inhibition will be examined.

The symposium will focus on criminal and quasi-criminal public behavior in which there is the use or threat of use of physical force. A central theme of the symposium will be a review by high-level planners and participants in four Presidential Commissions of the strengths, weaknesses, and accomplishments of that mechanism for shaping public policy.

Three sessions will examine crime, violence, and social control by focusing on the fundamental units involved: namely, the individual, the community, and the police. This categorization should permit a comprehensive overview of the causes, prevention, and mitigation of individual and mass violence as well as a review and comparison of current practices in relation to potentially useful or destructive alternatives for dealing with violence. Strong emphasis will be given to public policy implications and alternatives for law enforcement, courts, and rehabilitation. The influence of institutions outside of the criminal justice system also will be considered. The numberous new selection and training programs for dealing with these issues will also be discussed.

Joseph F. Coates, Seymour Halleck, Harold Cohen, John Conrad, Perry London, Arnold Sagalyn, Ted Robert Gurr, Frank Ochberg, Minor K. Wilson, Harland L. Randolph, Jerry Wilson, Norton Long, Kermit Coleman, Larry Tifft, William Carey, Lloyd Cutler, Henry S. Ruth, and Erwin D. Conham.

Contributions of U.S. Minority Groups to the Development of Science (30 Dec.)

Arranged by Raymond J. Seeger.

Despite many handicaps, persons belonging to minority groups have actually overcome their social difficulties and made significant contributions to the development of science in the United States. Representatives of various minority groups, viz., from America, Europe, Asia, and Africa report some outstanding individuals in each instance. Granted such success is possible, there will then be a round-table discussion as to how greater opportunities can be afforded in the future in line with a suggestion made a year ago by the AAAS Committee of Young Scientists. The discussants will include some young scientists.

C. Doris Hellman, Raymond J. Seeger, Frederick J. Dockstader, Bea Medicine, Beryl Blue Spruce, Juan Ramos, Constantine D. J. Generales, Chih Meng, E. Leong Way, George M. Fukui, Harry Kitano, T. S. Miyakawa, Percy L. Julian, Charles H. Wesley, James H. M. Henderson, Montague Cobb, and Warren Washington.

Scientific Organizations, War-Peace Issues, and the Public Policy Process (30 Dec.)

Arranged by Robert Pickus.

The Vietnam War, Pentagon-funded research, biological and chemical warfare have raised again fundamental problems of science and human values. These questions are brought into sharp focus in the controversy now raging within many scientific and professional organizations as to their proper relation to public policy issues. The conduct of professional meetings, the propriety of political resolutions, the very definition of the purposes and, therefore, of appropriate functions of professional and scientific organizations are all involved. Behind these specific questions lie profound differences of perspective on American society, the proper relation of knowledge to ethical choice, the character of the public policy process in this country and the right relationship of professional and scientific organizations to that process. Three speakers responding to orienting questions put by the chairman will set forth alternative views which set the parameters of the discussion. A related panel will explore, not the fundamental questions underlying the controversy, but proposed specific guidelines for professional and scientific organizations work on public policy issues.

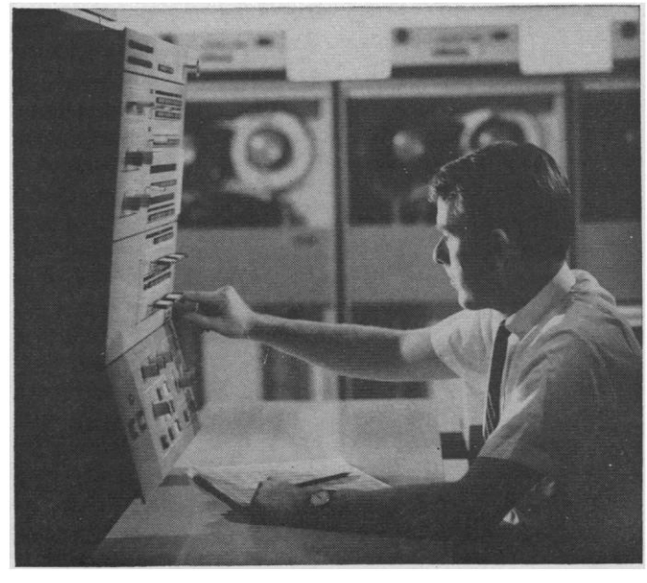
Leaders of professional, scientific and academic organizations have had to deal with a wide range of proposals for the engagement of their organization in moral and political issues. Directors of two inquiries into controversy over these matters will report on current problems and patterns of organizational behavior. Leaders of the Public Affairs committees of a number of AAAS member societies will report on their experience and give their reactions to proposed guidelines for an appropriate engagement of scientific organizations in the public policy process and in work to control the threat of war.

Dael Wolfle, Henry Eyring, Brian B. Schwartz, Robert Pickus, Jacob Bronowski, Christopher Wright, and Harland Bloland.

MATHEMATICS (A)

Vice Presidential Address (28 Dec.)

Speaker: Ralph P. Boas.
Calculus as an Experimental Science.



Numberless Scientific Applications of Computers (26 Dec.)

Arranged by Robert L. Ashenhurst.

The development of the automatic digital computer was a response to the need for extensive numerical calculation

in scientific problems. Although the range of computer applications now far exceeds this original concept, and indeed extends over almost every aspect of systematic human endeavor, there is still some tendency to conceive of scientific computer installations in terms of straight computational power. The presentations of this session are intended to focus attention on the variety of ways in which the computer figures in scientific investigations, and the implications of this technological advancement for science education.

Robert L. Ashenhurst, Melvin H. Mueller, Richard H. Miller, Peter H. Greene, Frederick W. Lancaster, and Peter G. Lykos.

Some Mathematical Questions in Biology (27 Dec.)

Arranged by Jack D. Cowan.

This is the fifth in a series of annual symposia whose purpose is to stimulate direct contact between biologists with some mathematical background and mathematicians. Three topics will be discussed, morphogenesis and development, the statistical mechanics of complex biological associations, and neurobiology. The main theme of the symposium will be the study of large-scale biological organization, and the way in which mathematics, computers and experimental investigations can complement each other in such studies.

Morrel H. Cohen, Brian C. Goodwin, Anthony D. J. Robertson, Lee A. Segel, Jack D. Cowan, Edward H. Kerner, Elliot W. Montroll, Richard B. Stein, and Bela Julesz.

Mathematics in the Undergraduate Program in the Sciences (28 Dec.)

Arranged by Ralph P. Boas.

The use of mathematics in the sciences has been increasing in recent years, but mathematics departments are often unaware of what mathematics is really needed in the undergraduate science courses; equally, the science departments often do not realize what they really use in these courses and what they should ask the mathematics department for. The talks will be directed, not to the mathematics required for research, but to the mathematics needed if the undergraduate is to be able to follow books and lectures in his own field.

Ralph P. Boas, William Bossert, Michael F. Dacey, and Mary L. Boas.

Aspects of Mathematics Teaching: Kindergarten to College (29 Dec.)

Arranged by Isabelle P. Rucker.

The Development of the American Association for the Advancement of Science Elementary Science-Mathematics Program, its influence in integrating the two subjects in the schools, and aspects of proposed activities in regard to the program.

The kinds of mathematics programs currently most prevalent in the high schools, their effect on the college mathematics programs, and suggestions for changes in both the school and college mathematics offerings.

Marie S. Wilcox, Isabelle P. Rucker, Richard Netzel, Daniel T. Finkbeiner, II, and William K. McNabb.

PHYSICS (B)

Vice Presidential Address (27 Dec.)

Speaker: Robert G. Sachs.
Time Reversal.

Elementary Particles and Symmetry (27 Dec.)

Arranged by Albert M. Stone and Robert G. Sachs.

Probably the deepest insight into natural philosophy devolves from the study of symmetries—symmetry in geometrical forms, symmetry in the arrow of time, the sign of charge, in left- and right-handedness. A major factor leading to the construction of the 500-billion volt proton synchrotron at the National Accelerator Laboratory has been the need to probe deeply into particle interactions to find the nature of the symmetries, where the symmetries are broken or denied, and what the consequences may be.

Edwin L. Goldwasser, Victor F. Weisskopf, Lee G. Teng, Gerald Holton, and Leon M. Lederman.

CHEMISTRY (C)

Genetic Diseases and the Quality of Life (29 Dec.)

Arranged by Albert A. Dietz and Donald T. Forman.

The study of the biochemical basis of genetic disease received its initial impetus from the papers of Garrod, published some 60 years ago. Subsequent work led to the identification of many types of biochemical abnormalities, their mode of inheritance, and many of the specific reactions involved. Recent work has placed more emphasis on the prediction of the development of genetic diseases with their eradication as a goal. Since not all genetic disease can be completely controlled, a better understanding of the nature of the defects and how they may be influenced will lead to technics for the improvement in the *quality of the lives* of the persons that may be affected.

Albert A. Dietz, David Y. Hsia, Herbert M. Rubinstein, Albert Dorfman, and Henri Frischer.

Chemistry Instruction and Social Concern (30 Dec.)

Arranged by William B. Cook.

William B. Cook, Robert West, M. Kent Wilson, Norman Hackerman, J. A. Campbell, William P. Slichter, Milton K. Snyder, and Rod O'Connor.

ASTRONOMY (D)

Results of the Apollo Program (29 Dec.)

Arranged by Louis S. Walter.

Louis S. Walter, Michael Duke, Charles C. Schnetzler, Joseph V. Smith, George W. Wetherill, Nafi Toksoz, William Kaula, and Alastair G. W. Cameron.

On Teaching Astronomy in the 70's (29 Dec.)

Arranged by Raymond J. Seeger.

Ever since Plato's Academy, astronomy has had a significant role in education. Have the development of planetaria and the landing of man on the moon had any

noteworthy effects on the teaching of astronomy? What is the relevance of astronomy to the social concerns of modern college students? This symposium deals with the use of planetaria and the role of astronomy in general education. In each case there is a panel discussion. The one on education will include students from universities in the Chicago area.

Helmut Abt, Joseph M. Chamberlain, Curtis L. Hemenway, Richard Berendzen, John R. Callow, Ian C. McClennan, O. Richard Norton, Von Del Chamberlain, Bart Bok, Frank Edmondson, Lawrence W. Frederick, George O. Abell, and Gibson Reaves.

Interstellar Molecules and Chemistry (30 Dec.)

Arranged by Bertram Donn.

Within the last two years six interstellar molecules have been found and identified by their microwave spectra and one, H_2, by its ultraviolet spectrum. At the time of writing five diatomic and five polyatomic species are known, the most complex being cyano-acetylene. These molecules, which must comprise only part of the molecular population of space, demonstrate that the interstellar medium is a significant chemical system. The origin and behavior of interstellar molecules pose major questions related to the formation of stars and planets and galactic evolution. The variety of organic compounds also has implications for the origin and extent of life in our Galaxy. As conditions in interstellar space differ drastically from those of ordinary terrestrial chemistry, interstellar chemistry has a much closer association with experiments under nonequilibrium conditions. Satisfactory progress necessitates more comprehensive knowledge of the relevant chemistry by the astronomer and a knowledge by the chemist of the existence of interstellar chemistry and the conditions under which it occurs. It is the aim of this symposium to be a beginning step in this direction.

Frank J. Kerr, Bertram Donn, Lewis Snyder, Carl Heiles, Louis J. Stieff, Donald R. Johnson, Gerhard Herzberg, Philip M. Solomon, Simon H. Bauer, and Gert Ehrlich.

GEOLOGY AND GEOGRAPHY (E)

Latest Results of the Deep Sea Drilling Project (26 Dec.)

Arranged by William E. Benson.

Drilling from the *Glomar Challenger* continues to supply new data and new surprises on the history of the oceans. Legs XI–XIV have shown a growing internationalization of the program as well as a remarkable drilling record. Comparison of the history of the restricted Mediterranean Basin with the developing Atlantic Basin is particularly instructive.

Ellis Yochelson, Charles T. Hollister, William A. Berggren, W. B. F. Ryan, and William E. Benson.

Land-Use Problems in Illinois (30 Dec.)

Arranged by Robert E. Bergstrom.

Illinois provides a setting for illustrating some of the land-use conflicts that are fostered by today's patterns of society and economy. An expanding population, with a larger ratio of population concentrated in urban areas, the increasing demand for food, consumer goods, minerals, and energy with accompanying production of more wastes, and growing public pressures on open spaces for recreation all contribute to conflict in the use of land. Furthermore, by building, manufacturing, mining, and farming man brings about massive changes—many of them impairments—in his physical environment. These activities affect his fellow man and heighten conflict.

Better understanding of the earth and water system, broader consideration of the effects of man's activities, and the realistic balancing of benefits, planning, administration of appropriate regulatory procedures, and capital are necessary to resolve these conflicts and preserve the amenities of the environment.

Robert E. Bergstrom, S. R. Aldrich, W. R. Oschwald, J. B. Fehrenbacher, Matthew L. Rockwell, William C. Ackermann, John R. Sheaffer, and Louis S. Weber.

Minor Metals of the Geochemical Environment, Health and Disease (30 Dec.)

Arranged by Helen L. Cannon and Howard C. Hopps.

The possibility of causal relationships between environmental factors and the occurrence of many degenerative diseases is slowly being recognized. One aspect of the environment—that concerned with the geochemistry of the rocks, soils, plants, and water—should be studied carefully and the minor element distribution compared with geographic patterns of animal and human health and disease. Relationships between the abundance of iodine and that of goiter and of fluorine with that of dental caries have been established, but the availability to animals and man of other minor elements that occur in the geologic environment is complicated by many factors. Differences in the availability of various minor metals will be brought out in the morning session by comparing *selenium*, which is absorbed readily by plants and animals with *iron* and *manganese*, the availability of which is complicated by many interrelated factors. The distribution and availability of minor elements in soils, plants, and human tissue will be reviewed in the afternoon session. The effect of lithium on cells and membranes and its possible protection against degenerative diseases will be examined. Finally, heart disease will be discussed as an example of a disease that has been studied in relation to trace element distribution in the environment.

Helen L. Cannon, Howard C. Hopps, John D. Hem, James C. Fritz, Donald J. Horvath, Hubert W. Lakin, James E. Oldfield, Robert L. Mitchell, Isobel H. Tipton, Lawrence Razavi, Hansford T. Shacklette, and Herbert I. Sauer.

BIOLOGICAL SCIENCES (FG)

Human Cell Biology; Scientific and Social Implications (26 Dec.)

Arranged by Herman W. Lewis.

The past 20 years have witnessed an explosion of knowledge of the molecular biology of bacteria and their viruses. A number of innovations in instrumentation and techniques have led to considerable understanding of the regulation of gene expression; the mechanism of protein synthesis; repli-

cation, mutation, repair and recombination of genetic material; the structure and function of membranes and the organization of subcellular structures within the cell. Recent advances in methods for handling cells in culture, animal viruses and somatic cell genetics make it possible to extend such studies to the human cell. This symposium will highlight the current status of our knowledge in these areas relevant to the human cell, discuss the kinds of information we may realistically hope to obtain in the next 5 to 10 years and assess the scientific and social implications of this new knowledge.

Robert Haselkorn, Joel Huberman, Harvey Lodish, Leroy E. Hood, Max E. Burger, and Richard Davidson.

Parthenogenesis (27 Dec.)

Arranged by James H. Oliver, Jr.

This symposium will serve to summarize and synthesize data on parthenogenesis in various invertebrate and vertebrate taxa. Unpublished data will also be included. The symposium is meant to be a descriptive panorama of parthenogenesis in various taxa; and it will include ecological, physiological, genetic, cytological and evolutionary considerations as well.

James H. Oliver, Jr., C. W. Birky, Jr., John J. Gilbert, R. M. Cable, Howell V. Daly, Conrad N. Slobodchikoff, Uzi Nur, Dan Hartl, E. L. Mockford, S. G. Smith, R. Jack Schultz, T. Paul Maslin, J. H. Asher, Jr., and George W. Nace.

Plant Population Dynamics (27 Dec.)

Arranged by Jack McCormick.

For nearly a century vegetation scientists have conducted censuses of plant populations to describe the structure of plant stands. This led to great advances, particularly during the past two decades, in our knowledge of plant population dispersion. For the most part, however, these descriptions have been static and selective. In only a few instances have the populations of a given area been reexamined periodically. And in still fewer instances have whole populations, from the smallest seedlings to the most aged veterans, been considered.

Plant population dynamics is not a new field of study, but it has been a neglected one until recently. The participants in this symposium demonstrate the breadth of the current approach—some are considering single populations; some are working on two or many interacting populations. Most of us are considering intraseasonal or short-term population changes, but one is concerned with the history of a single population during the past several thousands of years. Much of the research concerns populations of annual plants, but a few projects are investigating woody plants with lifespans of many decades, or even many centuries. A number of studies are being made in disturbed habitats, particularly in oldfields, but others concern unusual geologic outcrops, isolated desert mountain ranges, and mountain browsing lands.

This work is not just "esoteric ecology." Much of it does represent an effort to explore basic problems and to develop new general concepts. But it also is concerned with many of society's critical environmental problems. No hay-fever sufferer will doubt the importance of a study of population controls in ragweed. And with the rapid enlargement of the acreage in utility and highway rights-of-way, combined with the steady increases in traditional maintenance costs, this new knowledge of plant population dynamics has immediate application to management. Information concerning the reactions of populations to various stresses is useful in planning for industrial and urban land development. Weed population dynamics, particularly studies of newly introduced and potentially damaging species, can be important in preserving agricultural and forest productivity as well as in the reduction of control costs.

Jack McCormick, A. Clair Mellinger, Rebecca R. Sharitz, Irwin A. Ungar, C. W. Ferguson, Harold W. Steinhoff, Fakhri Bazzaz, Dudley Raynal, Stephen N. Stephenson, P. B. Cavers, Alan W. Haney, Gary E. Smith, Edward L. McWilliams, Buford R. Holt, and Alan J. Lewis.

Satellite DNA's (27 Dec.)

Arranged by Dorothy M. Skinner.

Although the work of Chargaff showed that the DNA of an animal species could be separated by column chromatography into fractions with different base compositions, it was not until 1961 that satellite DNA's were defined as such by Kit, Szybalski and Sueoka. In the ten intervening years, satellite DNA's have been demonstrated in numerous species. Since satellites are naturally enriched species of DNA, they offer a unique opportunity for the study of the biological role of a particular DNA species. Attempts have been made to localize them by subcellular fractionation (Kerr and Skinner). Those which have been localized in the nucleus have been found to be distributed on several chromosomes (Maio and Schildkraut). More recently, by *in situ* cytological hybridizations, some have been localized in the heterochromatin (Gall and Pardue). Only a few attempts have been made to see whether the satellites are active biologically (i.e. transcribed and translated *in vivo*); although the mouse satellite was studied in two cases, there were conflicting reports (Harel and Hanania; Flamm *et al.*). On the other hand, Miller has demonstrated the functioning of the satellite DNA (ribosomal DNA) of *Xenopus* by his well-known micrographs of genes in action.

Hewson Swift, Joseph J. Maio, Dorothy M. Skinner, Peter Rae, Margit M. K. Nass, Oscar L. Miller, and W. G. Flamm.

Separation and Depression: Clinical and Research Aspects (27–28 Dec.)

Arranged by Edward C. Senay and John Paul Scott.

This symposium brings together current clinical and experimental work on the relationship between separation from familiar individuals and objects and the pathological state of emotional depression. Age, genetics, and the quality and duration of the separation experience are factors that affect its outcome. Empirical treatments with antidepressant drugs are related to theoretical analyses of brain biochemistry. Certain animal research indicates that the separation-depression phenomenon is based on disturbances of a major social-motivational system. Present information on the causes, prevention, and treatment of this form of mental disease are summarized.

John Paul Scott, I. Charles Kaufman, William T. McKinney, Stephen J. Suomi, Harry F. Harlow, R. Charles Boelkins, Paxton Cady, Edward C. Senay, Gerald Klerman,

William Bunney, Frederick Goodwin, John L. Fuller, George Winokur, Thomas Holmes, Christoph M. Heinicke, Arthur Schmale, and Eugene S. Paykel.

Biology of Immunity in Amphibians (28 Dec.)

Arranged by E. Peter Volpe.

Amphibians hold pride of place in the field of experimental biology because of the incredible variety of ways that the embryo can be surgically manipulated without seriously impairing its chances of survival. Parabiotic fusions and chimeric combinations can be successfully undertaken, diverse tissue primordia can be interchanged by grafting, polyploidy can be readily induced, and genetically identical individuals (isogenic groups) can be produced by the ingenious technique of nuclear transfer. These, and other bold manipulative techniques, scarcely feasible in many organisms, afford the means of elucidating the nature of the immune reactions, the ontogeny of the immune response, and the phenomenon of tolerance.

The transplantation biology of the Amphibia has been more systematically investigated and is perhaps better understood than that of any other class of so-called primitive vertebrates. This information has helped to fill critical gaps in our understanding of the evolution of transplantation alloantigens and the immune response they elicit. Moreover, some species have provided a model system with which certain immunological problems common to both ectothermic and endothermic vertebrates can be investigated.

The symposium will bring together current findings on the rejection reaction itself and its modification by diverse agents (temperature, x-irradiation, type of graft), the preconditions for tolerance, the structure and synthesis of antibodies, the ontogeny of the immune response in relation to the lymphomyloid complex of amphibians, and the link between lymphoreticular neoplasia and immunity.

Robert Auerbach, John J. Marchalonis, Ronald R. Cowden, Robert F. Dyer, Nicholas Cohen, E. Peter Volpe, John D. Horton, and Laurens N. Ruben.

Development of Cell Organelles (28 Dec.)

Arranged by Joel L. Rosenbaum.

Four cell organelles have been chosen for discussion in this symposium: mitochondria, chloroplasts, basal bodies (centrioles), and microtubules. The presentations on mitochondria and chloroplasts will deal primarily with the DNA of these organelles. Dr. H. Swift and his collaborators have studied the morphology and function of mitochondrial DNA in a variety of cell types, using both ultrastructural and biochemical approaches. Dr. K.-S. Chiang has investigated chloroplast DNA replication, transmission, and recombination during both the mitotic and meiotic cycle of the green algae, *Chlamydomonas*. In addition, Dr. Chiang will present his recent results on the morphological changes in chloroplasts during meiosis. Dr. Ruth Dippell will discuss ultrastructural work on the development sequence of ciliary basal body formation in *Paramecium*. Her work on the nucleic acid content of basal bodies will also be presented. Dr. G. Borisy was instrumental in developing methods for the isolation and characterization of microtubule protein as well as designing the specific colchicine-binding assay for this protein. He will discuss some of his work on the biochemical characterization of the protein, and will also describe recent results on the aggregation of microtubule protein in vitro.

Joel L. Rosenbaum, Hewson Swift, K.-S. Chiang, Ruth Dippell, and Gary Borisy.

Human Ecology (28 Dec.)

Arranged by George B. Happ and Eduard C. Brandt, Jr.

The fundamentals of human ecology are expressed in humans and their environments. Here we have ready access to many descriptive and functional conditions already initiated in the history of mankind and its many environments. Humans have progressed mentally more rapidly than they have progressed physically. The environments, particularly in contact with humans, have been expanded. A brief résumé of any modern aspect in industry, commerce, and transportation readily illustrates this advancement. In illustration, the current facilities of transportation far exceed the human on foot; the facilities of the wheel have increased the less-sustaining support of humans and animals; and the steam, gas, electric, and jet sources have far exceeded earlier means of support in human activities.

The many progressive stages in civilization of humans, their environments, their improving relations and sustaining results seen in their correct perspective explain more correctly the basic steps of advancement evident on all sides. We humans need to recognize and support with more encouragement these increasingly constructive supports and foster their replacement of less satisfactory stages in human ecology in civilization.

George B. Happ, Eduard C. Brandt, Jr., F. Chronister, and Margaret S. Ratz.

Solutions to Environmental Problems (28 Dec.)

Arranged by Bruce Wallace and David L. Jameson.

An examination of some aspects of some of the environmental problems. This will include an attempt to integrate information from diverse fields and will include both scientific factors which require consideration and the conclusions reached by the investigators as they apply to modern society.

Bruce Wallace, Basset McGuire, Ledyard Stebbins, Haven Kolb, Richard Lewontin, David L. Jameson, David Pimentel, and Robert Reis.

Water Quality and Fisheries in the Upper Great Lakes (28 Dec.)

Arranged by Clarence A. Carlson.

The Great Lakes are among the largest freshwater lakes in the world and together comprise the world's largest reservoir of fresh water. This exceedingly valuable natural resource of the United States and Canada, like many others, is undergoing deterioration as a result of the activities of our growing human population. General deterioration of the environment and the special problems of Lakes Erie and Ontario have recently received considerable attention. This symposium will attempt to focus attention on the problems of Lakes Superior, Michigan, and Huron by bringing together individuals with particular knowledge of these lakes and their biota. Representatives of major centers of research will present reports on research in progress and consider the outlook for the future.

Clarence A. Carlson, A. M. Beeton, Eugene Stoermer, Andrew H. Lawrie, Stanford H. Smith, Lloyd Lueschow, E. Graham Bligh, Ross Horrall, and Jonathon Bulkley.

The U.S. Contribution to the International Biological Program (28–29 Dec.)

Arranged by the U.S. National Committee for the International Biological Program (National Academy of Sciences).

The International Biological Program (IBP) is a 58-nation study of biological productivity and human adaptability. The U.S. National Committee for the IBP has initiated multidisciplinary studies to obtain the theoretical basis necessary to solve or minimize problems of human adaptability and problems of environmental management. These studies are referred to as integrated research programs. Integrated research programs were initiated because the scale of these problems is larger than the scale of conventional research.

The purpose of this symposium is to describe the progress of the U.S. contribution to the IBP. This symposium will discuss the integrated research program and its impact on research and teaching. Representative results will be presented of the studies now being performed on human adaptability.

Charles F. Cooper, Stanley I. Auerbach, George M. VanDyne, Douglas G. Chapman, David E. Reichle, O. Lee Kline, William S. Laughlin, David R. Hughes, Richard E. Ward, C. Glen King, Richard C. Dugdale, Jorge Morello, Richard D. Sage, Antonio Cruzado, and Theodore Packard.

Libbie H. Hyman Memorial Symposium on the Biology of the Turbellaria (28–30 Dec.)

Arranged by M. Patricia Morse, Horace W. Stunkard, and Nathan W. Riser.

The three-day symposium entitled "Biology of the Turbellaria" is presented as a memorial to Dr. Libbie H. Hyman who passed away in August 1969. Specialists from the United States and from fourteen foreign countries will present papers in sessions concerned with the following subjects: ecology, systematics, morphology, reproduction and regeneration.

Nathan W. Riser, Tor G. Karling, Eveline Marcus, Masaharu Kawakatsu, T. B. Reynoldson, Robert W. Pennak, Ernest R. Schockaert, Robert W. Mitchell, E. Ruffin Jones, Frederick F. Ferguson, Julian T. Darlington, Clay M. Chandler, Ian R. Ball, Reinhard M. Rieger, Frank A. Brown, Mario Benazzi, Etienne Wolff, Jan Hendelberg, J. B. Jennings, Eugene N. Kozloff, Roman Kenk, Harold Koopowitz, Arnfried Antonius, Th odor Lender, Marie Jenkins, Philip Neil Harper, Cazelyn G. Bookhout, Celina Bedini, Floriano Papi, C. Den Hartog, Aage Møller Christensen, Jay Boy Best, Rupert Riedl, Valeria Mac-Fira, Wolfgang Sterrer, Jean L. Poulter, and Alan B. Thum.

Analytic Problems in the Study of Animal Behavior (29 Dec.)

Arranged by Stuart A. Altmann.

Eliot D. Chapple, F. James Rohlf, Joel E. Cohen, Walter Heilingenberg, Jeanne Altmann, William H. Bossert, S. S. Wagner, and Stuart A. Altmann.

In collaboration with other IBP countries, natural production is also being assessed on a worldwide basis. [Colorado State University]

Comparative Studies of Calcitonin and Ultimobranchial Bodies (29 Dec.)

Arranged by Nancy B. Clark.

The speakers will present up-to-date reviews of the literature as well as recent research findings in their laboratories regarding the role of calcitonin and ultimobranchial bodies in calcium regulation in the various vertebrate groups.

Nancy B. Clark, Peter K. T. Pang, Douglas R. Robertson, Leonard F. Belanger, and Philip F. Hirsch.

Problems in Cladistic Inference (29 Dec.)

Arranged by Warren H. Wagner, Jr.

In recent years purely phenetic approaches to the quantitative study of diversity have more and more been replaced by efforts to make objective inferences about evolutionary pathways. In this symposium, we shall use the round table discussion approach and concern ourselves with defining the problems of cladistic inference. What is the relationship between classical numerical phenetics and quantitative phyletics? What are the relative values of characters? What is the role of homoplasy? Is there a relationship of genecology to phyletics? These and other questions present serious problems in developing consistent methodology.

Warren H. Wagner, Jr., David C. Eades, James S. Farris, Walter M. Fitch, and Arnold G. Kluge.

Techniques of Investigation and Current Concepts in the Physiology and Biochemistry of Sex Steroid Action (29 Dec.)

Arranged by Robert D. Lisk.

Many analytical techniques are currently in use by various laboratories where sex steroid action (androgens, estrogens, progestins) is being studied in regard to both physiological and behavioral regulation of the reproductive potential of the organism. Experiments conducted during the past 10 years, using the techniques of ablation or localized hormone implantation clearly demonstrate that many regulatory functions exerted by hormones occur via interactions at the level of the central nervous system. Direct

evidence that hormones do regulate the functions assigned to them requires the ability to directly monitor blood levels of hormone in order to show that hormones are present at the times and in the patterns necessary for regulation of the function under study. How does a hormone interact with its target tissues? What parameters of this interaction can we measure and how can one relate these measurements to the mode of action of the hormone? Current developments in gas chromatography, methods in electrophysiology for simultaneous measurement of EEG and unit activity and biochemical analysis for measuring hormone retention by tissues offers a battery of highly sensitive analytical techniques which are providing new insights concerning hormone functions since studies in the individual intact organism are possible. In his discussion, each speaker will cover a broad spectrum of studies relating to the technique he is presenting. This approach should have a wide interdisciplinary usefulness to behaviorists, physiologists, and biochemists.

Robert D. Lisk, John Resko, Walter E. Stumpf, and Barry Komisaruk.

Urban Ecology Today (30 Dec.)

Arranged by Forest Stearns, Charles M. Kirkpatrick, and Robert Brander.

Forest Stearns, Robert Brander, Carl Carlozzi, Frederick O. Lanphear, Alan Beck, Charles M. Kirkpatrick, Robert S. Dorney, Jack McCormick, Cameron Kitchen, and Michael Meshenberg.

ANTHROPOLOGY (H)

Vice Presidential Address (26 Dec.)

Speaker: Margaret Mead

Primitive Life Styles; Once Lost, Irretrievably Lost.

This lecture will illustrate the kinds of materials which it is now possible to preserve, both as a heritage of the primitive peoples who are leaving their past behind them, but may want access to it again, and as a contribution to the knowledge of the whole world on human possibilities. In the past, only stone survived; today we can preserve the delicacy of gesture and intonation, and even see, when he himself points the camera, what primitive man saw in the world around him.

The Aleutian Ecosystem (26–27 Dec.)

Arranged by William S. Laughlin, Jean S. Aigner, and Robert F. Black.

The Aleutian Islands as the south margin of the Bering Land Bridge provide a unique group of people in a unique geologic and geographic setting, or ecosystem, for study of human adaptation and evolution. There the Aleut population system maintained its distinctive racial, linguistic and cultural integrity over a linear, longitudinal distance up to 1,250 miles for more than 8,500 years. Input of people was restricted to one point, the east end of the island chain, and likely to one specific interval of time.

The geographic and cultural isolation and constantly productive marine habitat through time further configured the density, distribution, homogeneity, evolution and cultural

Shoreline of Anangula Island, Alaska, site of Aleutian anthropological studies. [W. S. Laughlin]

adaptation of the Aleuts in an ecosystem that is, and has remained, stable for thousands of years. The record is decipherable because archaeological materials spanning 8,500 years are unusually abundant. These materials and the large population size demonstrate the remarkable diversity, richness, and accessibility of the food supply.

Robert F. Black, William S. Laughlin, Thomas Meyers, Glenda B. Denniston, Ruth Sternbach, Jean S. Aigner, Craig Fisher, Michael Zimmerman, Albert Harper, Karl W. Kenyon, Lois K. Lippold, and Joan M. Hett.

Biologic Relativity (27 Dec.)

Arranged by E. R. N. Grigg.

The graph of the variation in time of the rate (or magnitude) of *any* biologic response to a *single* stimulation shows an early peak and a damped descending limb. Growth and all other dynamic aspects of life are more or less disguised responses to stimulation, hence this asymmetric curve (herein called the *primordial pattern*) is ubiquitous in biologic illustrations. In nature, though, multiple stimulation is the rule. The susceptibility to superimposed stimulation varies with the phase of the response to the initial stimulus. Therefore the definition of any respondent, if it is to be complete, must include the stage of the response reached at the time under consideration—which is expressed by the term *biologic relativity*. For more information see the paper by Grigg, in *Human Biology* **42**, 151–183 (May 1970). Examples of primordial pattern will be analyzed at the morning workshop. The afternoon colloquium will explore the need for changing current concepts in the light of biologic relativity. Audience participation is welcome. Grigg claims universality for the primordial pattern, and paternity for the idea of biologic relativity. Anyone who wishes to contest either claim is insistently invited to bring proof to the contrary on 2 by 2 slides for showing at the Symposium.

Morris Fishbein, E. R. N. Grigg, Josep G. Llaurado, Gabriel W. Lasker, Jacob I. Fabrikant, William B. Bean, Paul A. Nelson, William W. Stead, and Herbert E. Kubitschek.

User Participation in the Housing Process (28 Dec.)

Arranged by John F. C. Turner.

Dwelling environments act as barriers or as vehicles for social and economic development according to the nature of the user's role in the housing process in a variety of contexts and locales. Using recent low-income housing studies as a data base, it will be argued that where inhabitants control the main decisions and are free to make their own contributions in the preparation, construction and/or management of housing, both this process and the environments produced will stimulate healthy growth. Where people have no responsibilities for their housing choice and no significant participation in the process, it will be argued that the dwelling environment may instead become a burden and a barrier to development.

Donald A. Schon, Rolf Goetze, Peter Grenell, William Grindley, Hans Harms, Aprodicio Laquian, Anthony Leeds, Harold A. Levin, Carla Okigwe, John F. C. Turner, and Lisa Peattie.

PSYCHOLOGY (I)

University Open Admissions (27 Dec.)

Arranged by Lloyd G. Humphreys.

The symposium will bring together information relevant to university admission policies for the "disadvantaged." Topics will include statistical studies of the predictive value of standardized tests; studies of admission procedures, dropout rates, and proficiency levels of graduates; surveys of compensatory programs; and case studies of the experiences of several individual institutions.

Lloyd G. Humphreys, Ann Clarey, Alexander W. Astin, Charles L. Thomas, John Bowers, William L. Tetlow, Jr., and Benjamin Rosner.

The Developmental Sciences: State and Fate of Research Funding (27 Dec.)

Arranged by Victor H. Denenberg.

During the past 15 years there has been a rapid rise in the number of studies investigating developmental processes and their underlying mechanisms. Researchers from various fields within the biological, behavioral, and social sciences have been interested in and have made contributions to our knowledge about development. One generality which has emerged from this research, which encompasses both human and nonhuman subjects, is that the appropriate manipulation of biological and experimental factors during early development, including prenatal development, may have far-reaching effects upon the subsequent behavioral and physiological characteristics of the subject.

One of the difficulties of doing work in this area is that the researcher must be willing to make a long-term commitment of himself and his research facilities. Thus, it is necessary that the researcher be assured of long-term stable financial support so that he can accomplish his research objectives. With the general reduction of federal funding for research, it seems appropriate to assess the status of funding within the developmental sciences since the necessity of a long-term commitment represents a rather unique situation.

Victor H. Denenberg, Sheldon H. White, Seymour Levine, Leon Eisenberg, Gilbert W. Meier, Gilbert L. Woodside, Kenneth Klivington, and Richard Louttit.

The Interface Between Psychoanalysis and Education (27 Dec.)

Arranged by Gaston E. Blom.

There have been two streams of thought and experience from the professions of psychoanalysis and education which have tended to either conflict or to operate relatively independent of each other. Within both professions there has been revitalized concern and reflection about the social relevance and effectiveness of their contributions. As a result an interface has more strongly developed between them with the potential of mutual enrichment of theory and practice. Education has stressed, and stresses a competence model of skill development in cognitive, physical, and social areas. Psychoanalysis has emphasized, and emphasizes an individual personality development model stressing feelings, conflicts, relationships and inner emotional life. An integration of these two streams of professional thought can be represented in the psychoeducational approach.

Gaston E. Blom, Albert J. Solnit, Manuel L. Jackson, Maria W. Piers, Nicholas J. Long, and Sebastiano G. Santostefano.

Critical Issues in Research Related to Disadvantaged Children (28 Dec.)

Arranged by Donald L. Peters.

With the likelihood of continued expenditure of large sums of public and private money for research involving disadvantaged children and early intervention programs, public and scholarly interest has been aroused by four vital areas which have direct bearing on the validity, generalizability, and dissemination of research findings. The four areas of concern are (1) the political and social pressures involved in the selection of evaluational designs and models, (2) the selection of appropriate measuring instruments, (3) ethnic and cultural biases brought to the research by the researcher, and (4) the responsibility of researchers and evaluators for the accurate presentation and cautious dissemination of the results of their studies. The solution of the issues evolving in each of these areas will play a major role in determining the credibility of social science research findings as a source of useful information in determining public policy.

Donald L. Peters, Walter L. Hodges, James O. Miller, and Joseph H. Stevens.

The Impact of Colleges on Students (28 Dec.)

Arranged by Alexander W. Astin.

The symposium will deal with current empirical research concerning how students are affected by their colleges. Each of the participants is associated with a major longitudinal research project utilizing comparative data from several institutions. The participants will present and discuss their most recent research findings concerning how the student's cognitive and affective development is influenced by his experiences in college. The discussion will focus on the implications of these findings both for educational policy and practice and for future research on the higher educational institution.

Dael Wolfle, Kenneth M. Wilson, Donald A. Rock, Leonard Baird, Robert Linn, Alexander W. Astin, Arthur W. Chickering, Alan E. Bayer, and C. Robert Pace.

Mechanical Factors in Speech Production (29 Dec.)

Arranged by Fred D. Minifie.

Normal speech production involves complex coordination of several mechanical systems, particularly the respiratory, laryngeal, and oral systems. Regulatory control over the mechanical aspects of these physiological systems is crucial to normal sound production, modification, and transmission. Recent development in transducer technology and insightful application of these technologies have made possible a detailed description of each mechanical system used in speech production, and an understanding of some of the mechanical and physiological interactions among these systems. The purpose of this panel is to review the current knowledge of the mechanical aspects of speech production and to discuss the theoretical implications for normal and abnormal speech production.

Fred D. Minifie, Thomas J. Hixon, David Dickson, and Raymond Kent.

Human Behavior and Its Control (30 Dec.)

Arranged by William A. Hunt.

The symposium is designed to bring out the breadth and complexity of man's scientific approach to the understanding of human behavior, as well as its relevance to contemporary social problems. Conventional approaches will be supplemented by the newer interactional and transactional approaches in an attempt to focus on man as an organism living in an environment which both offers him opportunity for adaptation and limits the direction such adaptation may take. Attention will be given to the problems of behavior modification and control with discussion of techniques ranging from the use of pharmacological controls and conditioning methods with the simpler behavior functions, to the use of attitude, values, small group experiences, and environmental manipulation. The symposium will close with a discussion of the ethical questions arising from the increasing attempts to control human behavior.

William A. Hunt, George G. Stern, Raymond W. Mack, Robert C. Carson, Ronald E. Walker, Alan Rechtschaffen, Milton Rokeach, Gerard Egan, and Perry London.

SOCIAL AND ECONOMIC SCIENCES (K)

Policy Sciences: A New Supradiscipline and Its Implications (26–27 Dec.)

Arranged by Yehezkel Dror.

Policy sciences are a new supradiscipline devoted to the study and improvement of policy making. Trying to increase the applicability of systematic knowledge, structured rationality, and organized creativity to complex policy issues, the development of policy sciences requires significant changes in the paradigms of science, approximating in some respects a "scientific revolution." Policy sciences are especially concerned with the improvement of metapolicies, that is, policies on how-to-make policies. Explicit redesign of the policy-making system and explicit decisions on tacitly assumed megapolicies (i.e., postures and strategies underlying different policies; for instance, on basic goals, problem perception, risk acceptability and attitudes to time)—these are among the foci of policy sciences.

The development of policy sciences, if successful, will have far-going implications for politics, many other facets of society, and the scientific community itself. Possible implications include, for instance: (a) New forms of citizen participation in policy making, combined with novel presentation of policy issues in the mass media and changes in education, so as to prepare citizens for more active roles in societal decision processes. (b) New structures for policy research, such as a variety of "think tanks" dispersed throughout the societal direction system, with some working for the public at large and for "anti-establishments." (c) Arrangements permitting elected politicians to study, so as to be able to utilize new knowledge without being overwhelmed by it, through sabbatical leave, special courses for politicians, etc. (d) New policy sciences professionals—with novel roles and difficult problems of ethics—to be developed at new educational institutions combining characteristics of present universities and "think tanks."

Some of these and other broad implications will be discussed at the symposium, together with selected problems of research in policy sciences.

Yehezkel Dror, Harold Lasswell, Alexander Szalai, Christopher Wright, Michael Radnor, Edward Quade, Peter Szanton, John Dixon, and Douglas Bunker.

The Grants Economy (26–27 Dec.)

Arranged by Janos Horvath.

The Grants Economy consists of all one-way transfers of exchangeables—conventionally referred to as unilateral transfers within the economic system. In an act of exchange between two parties, A and B, A gives something to B and B gives something to A. In a grant A gives something to B and B gives nothing, or less than full compensation, in the way of clearly identifiable exchangeables to A. Grants economy has been rising quite rapidly in modern societies at both the domestic and the international levels. The interests of this symposium include the study of theoretical aspects, especially measuring techniques of unilateral transfers, as well as empirical examinations regarding motivations and attainments of various types of policies.

Martin Pfaff, Byron Brown, Thomas Muller, Charles Waldauer, Donald L. Phares, Kenneth E. Boulding, George A. Daly, Fred J. Giertz, A. Allan Schmid, Thomas M. Havrilesky, A. Myrick Freeman, Robert H. Strotz, Colin Wright, Selma Mushkin, Gordon Tullock, Wolfgang Stuetzl, Julius Rezler, Bruce Stuart, Robert A. Solo, Irving Leveson, Janos Horvath, Donald P. Minassian, Tapan Mukerjee, Patrick Yeung, Victor E. Tokman, and Theodore K. Ruprecht.

Social Consequences of Demographic Phenomena (27 Dec.)

Arranged by David D. McFarland.

Certain social consequences of demographic phenomena are well known and, indeed, are currently attracting considerable attention from both scientists and laymen. Perhaps the most attention has been received by the hypothesized relationships between various social ills—environmental pollution, crime, slums, etc.—and the rates of increase of popu-

lation size and density. This session is designed to go beyond these familiar topics to explore a relatively neglected area, consisting of a wide range of other social consequences—not necessarily undesirable—of demographic phenomena. Particular emphasis will be given to effects of demographic phenomena other than sheer population size and density; this includes effects which do not exist under conditions of steady growth, but arise only as a result of short-term fluctuations in vital rates over time. Among consequences to be considered are various aspects of the structure of family and kinship, the status of women, availability of marriage partners, the composition of the electorate, and the structure of the educational system.

Philip M. Hauser, Valerie K. Oppenheimer, Parker G. Marden, Robert Harrison, and David D. McFarland.

The Ph.D. Surplus? (27 Dec.)

Arranged by Lee Grodzins.

Lee Grodzins, Allan M. Cartter, Helen S. Aston, Hugh Folk, Robert E. Henze, Philip Handler, Thomas Mills, and John D. Alden.

Science and Democracy (27 Dec.)

Arranged by Harvey M. Sapolsky.

The symposium will discuss the question: Do advances in science and technology serve or frustrate the democratic aspirations of the society? Some have argued that such advances will make democratic government less likely as they necessarily force a centralization in decision making and provide the mechanisms to control human behavior. Others have argued that progress in science and technology promotes the prospects of a true democracy by increasing man's capacity for material and intellectual independence. The available empirical evidence and alternative theoretical frameworks useful in considering the relationship between science and democracy will be examined.

Sanford A. Lakoff, Duncan Macrea, Jr., and Alan F. Westin.

National and International Dimensions of Science Policy (27 Dec.)

Arranged by T. Dixon Long.

As national expenditures for research and development activities mount, the effort to achieve solutions to national and international problems through the application of research and development takes on greater importance in public affairs. New institutional forms and innovations in public policy have attracted the interest of governments of industrial nations, and the attention of international organizations charged with ameliorating or avoiding unwanted effects of global industrial expansion.

Juergen Schmandt, Eugene B. Skolnikoff, T. Dixon Long, and Christopher Wright.

Vice Presidential Address (27 Dec.)

Speaker: Robert M. Solow.

The Economics of Pollution.

Research and Development Policies of Selected Federal Domestic Agencies (28 Dec.)

Arranged by James D. Carroll.

One of the contemporary demands in the scientific community in the United States is the demand for "socially relevant" research and development and for a more effective direction and application of research and development to social needs. In a series of research reports, members of this program section examine and analyze the present and potential capabilities of several domestic agencies to develop and support the use of research and development for domestic social purposes.

James D. Carroll, Richard A. Rettig, James E. Mahoney, Roger E. Levien, Stephen P. Strickland, Stephen S. Baratz, Bruce R. Smith, Allan K. Campbell, and Todd R. LaPorte.

How People React to Technology (28 Dec.)

Arranged by E. G. Mesthene.

Reports on recent empirical studies of how men (as workers and as citizens) react to technology. One report will discuss the relationship between the technological demands of the workplace and the psychological character of workers. Another will present the preliminary results of a survey of public attitudes toward technology. The commentators are expected to examine the theoretical implications of the findings and to discuss the contribution that such empirical studies can make to our understanding of the impact of technology on society.

E. G. Mesthene, Michael MacCoby, Irene Taviss, Marcus Raskin, and Daniel Bell.

Recent Studies in the Sociology of Science (28 Dec.)

Arranged by Bernard Barber.

Recent work in the sociology of science has moved toward the explicit testing and refinement of generalized socialized concepts and propositions through the use of statistical analysis of empirical data collected in surveys of nationally representative samples. These two sessions demonstrate this movement as it manifests itself in two areas, social stratification and the ethical problems of biomedical researchers.

Bernard Barber, Daniel Sullivan, Julia Makarushka, John Lally, Warren O. Hagstrom, Jonathon R. Cole, Stephen Cole, Lowell L. Hargens, and Harriet A. Zuckerman.

Metric System: Status of Adoption by the U.S. (28 Dec.)

Arranged by Richard W. Mattoon.

The metric system has been modernized into an International System of Units (S I) with six basic units plus derived units. The metric system is used by some 90% of the world's population. England is already midway through its ten-year transition. Canada, the Irish Republic, Australia, and New Zealand are likewise in transitional phases. The U.S. Metric Study Bill of 9 August 1968 authorized the Secretary of Commerce to report to Congress in three years on a survey of the impact, desirability, feasibility, and cost of conversion. Extensive conferences and tabulated questionnaires in the fall of 1970 will contribute to the final report. Conversion to the metric system involves problems to industry, education, and the general public. Manufacturing machinery, specifications, property surveys, etc., will have to be phased into the metric system as they need replacement or revision, over a reasonable period. Our educational courses will need modification from kindergarten up; however, the load and confusion will be reduced by

teaching only one logical system instead of two. The mass media—newspapers, magazines, books, radio, and television—will have a large responsibility of instruction to those unfamiliar with a new measuring language. There are great advantages in having only one simpler system used throughout the world in this age of growing international communications, travel, and commerce.

Richard W. Mattoon, J. D. Graham, Albert J. Mettler, Louis F. Sokol, Henry C. Parsons, J. V. Odom, Douglas V. Frost, John N. Howard, John M. Flowers, Leonard Reiffel, and Brian R. T. Frost.

Directions in Religious Organization (28 Dec.)

Arranged by Ross P. Scherer.

For many Americans church membership has been "ascribed" at birth and so is somewhat involuntary. For many decades, it has been taken for granted that American denominational growth would only be upward. However, these complex denominational organizations are now for the first time encountering membership declines and some disaffection with organized forms of religion. In recent years, American religious organization is becoming more self-consciously "voluntary." How are religious organizations reacting to these trends, to fiscal retrenchment, to the cry for new structures? How are religious professionals reacting? What is the current situation of national denominational structures on the levels of the interdenominational, the denominational, the subdenominational or auxiliary, and the local or congregational? What is the future of complex religious organization: Protestant, Catholic, and Jewish? What about that of the black denominations? How do religious organizations behave like other complex organizations or other voluntary associations? How do they behave *differently from* them? Why? How can modern organizational theory shed light on the adaptational problems of religious organizations?

Ross P. Scherer, William A. Norgren, Arthur X. Deegan, Preston M. Williams, Daniel J. Elazar, James R. Wood, Richard A. Schoenherr, John P. Koval, Douglas W. Johnson, Earl D. C. Brewer, and Thomas C. Campbell.

Realizing Community Potential through the Redesign of Services (29 Dec.)

Arranged by Harold A. Richman.

Society's way of providing essential community services to people who need them are experiencing increasing criticism and scrutiny. Services and the agencies that render them, particularly those that affect urban residents of low-income communities, are widely regarded as outmoded and ineffective.

In response to the inadequacies and failures of existing mechanisms, the residents of Woodlawn, a mile-square low-income black neighborhood adjacent to the University of Chicago, prepared a Model Cities proposal through The Woodlawn Organization (TWO). The plan, which has been called a landmark in the movement towards community self-determination, breaks radically with traditional approaches to resolving community needs for housing, health, income, social welfare and other services in that the community proposed a way to determine what and how services would be offered and a way for residents to be active in the administration of these services. Consultation on pertinent problems was provided when solicited by members of the University of Chicago faculty.

While the plan was not funded by Model Cities, many of its components are being implemented. This symposium offers a general presentation of the community's plan, a look at how it is translating it into action in two of the areas of community concern, and a presentation on the University's role as neighbor and consultant.

Harold A. Richman, Arthur M. Brazier, Robert S. Daniels, Leon Finney, Julian H. Levi, Jack Meltzer, and Robert B. McKersie.

Goals Analysis—Looking Ahead to 1980 (29 Dec.)

Arranged by Leonard A. Lecht.

The symposium will provide an overview of current goals research and its implications for national policy in the coming decade. Recent work in goals analysis indicates that the cost of implementing national goals can be estimated in dollar and manpower terms. Research also shows that choices among goals can be more rationally determined by taking into account the outputs of programs in pursuit of goals, and the tradeoffs among them. Techniques for assessing feasible alternative futures provide an implicit or explicit frame of reference for goals analysis. Priority choices in the 1970's related to these alternative futures can have a significant influence on the level and the distribution of the nation's research and development effort.

Leonard A. Lecht, Anthony Wiener, Nestor Terleckyj, Charles Williams, Wilfred Lewis, George Gols, Robert Ayers, David Ifshin, and Ian H. Wilson.

New Approaches in the Formulation and Evaluation of Public Policy (29 Dec.)

Arranged by Samuel J. Bernstein.

This symposium has the objective of showing the utility of rigorous quantitative analytical approaches to the formulation and evaluation of public policy making. Specifically, air pollution, crime, and public resources allocation programs are to be examined from this new perspective. Discussion will evaluate further these three areas in the light of recent and expected developments in the theory and practice of public policy studies and research.

Samuel J. Bernstein, Arnold Kalish, Ronald E. Grieson, Hossein Ahmadi, W. Giles Mellon, and Walter Helly.

The Economics and Politics of Large-Scale Technological Programs (30 Dec.)

Arranged by Daniel Rich.

Large-scale programs in technology are the most costly and most controversial components of federal R & D appropriations. Recently there has been concern expressed about cost and time overruns which apparently have plagued these programs. In addition, several attempts have been made to reform the methods by which technological programs are initiated and managed. This symposium will bring together empirical studies in economics and political science in an effort to understand the factors which affect the origins and outcomes of such programs. The focus of attention will be on the problems of technological innovation and success in bureaucratic settings.

Albert O. Hirschman, Robert Perry, Harvey M. Sapolsky, Frederic M. Scherer, and W. Henry Lambright.

HISTORY AND PHILOSOPHY OF SCIENCE (L)

George Sarton Memorial Lecture (28 Dec.)

Speaker: G. Evelyn Hutchinson.

Attitudes Towards Nature in Medieval England: The Alphonso and Bird Psalters.

The 1970 Sarton Lecture reconstructs the attitude towards nature held in western Europe about 1300 from evidence collected from a group of English illuminated manuscripts, which picture some fifty birds belonging to about twenty species. The earliest of the books, the Alphonso Psalter, was made by Dominicans, probably at Blackfriars in London; it very likely reflects Alberties Mangus' promotion of the study of natural history by the order. The production of such books flourished in England during the last quarter of the thirteenth century. The tradition then passed to the continent, where it can be followed to the late fifteenth century, when it began to influence the field of renaissance scientific illustration.

World Cities of the Future (26–30 Dec.)

Arranged by Bertram M. Gross.

John Dyckman, Jack C. Fisher, Jorge Hardoy, Janet Abulughod, Laurence Moss, Jere W. Clark, Edward H. Haskell, Joseph Velez, Sherman Price, William M. Gray, Wesley L. Gould, Alan Sheldon, Frank Baker, Harry Holder, Curtis McLaughlin, Kent Mingo, Vincent Navarro, Harold Rashkis, Richard Seder, Lenard Troncale, Bertram M. Gross, Daniel M. Duncan, Nathan D. Grundstein, Douglas R. White, Terry M. Clark, Philip C. Nunn, Luther P. Gerlach, Ido DeGroot, Marvin D. Strauss, Milton Rubin, Ernest Weissman, Ezra Ehrenkrantz, Charles Ehler, Paolo Soleri, Julius Stulman, Britton Harris, Andre Farhi, Gean Dufour, William C. Wheaton, and Alfred W. Jones.

Early Modern Biology (27 Dec.)

Arranged by Theodore M. Brown.

William Coleman, Jerome J. Bylebyl, Robert Frank, M. Jonathan Hodge, and Theodore M. Brown.

Electrical Technology, 1870–1900 (27 Dec.)

Arranged by Otto Mayr.

Three case studies will analyze the complex interplay of scientific discovery and financial interest in the rise of electrical technology in the last third of the nineteenth century.

Bernard S. Finn, James E. Brittain, Thomas P. Hughes, and Otto Mayr.

Renaissance Optics (27 Dec.)

Arranged by David C. Lindberg.

Edward Rosen, David C. Lindberg, Samuel Y. Edgerton, Jr., Stephen Straker, and Richard S. Westfall.

Science in the Nineteenth Century (27 Dec.)

Arranged by J. L. Heilbron.

Roger Hahn, Frederic L. Holmes, Charles Rosenberg, and Russell McCormach.

Topics in the History of Technology (27 Dec.)

Arranged by Melvin Kranzberg.

This Works-in-Progress session will feature brief reports on current projects and research work in the History of Technology.

John G. Burke, Asit K. Biswas, Edward C. Ezell, Louis F. Gorr, Philip D. Spiess, II, Darwin H. Stapleton, and James Mulholland.

Hiroshima—25 Years Later (28 Dec.)

Arranged by George Wald.

The point of this symposium is to review in the perspective of 25 years the history, impact and meaning of Hiroshima. The participants in this symposium will review and attempt to evaluate the scientific and political background for the preparation of the bomb and the decision to drop it; and the medical, psychiatric and psychological effects on the Japanese people. The speakers and the subsequent discussion will attempt to stress the relevance of these events for our present world situation.

Alice K. Smith, George Wald, Gar Alperovitz, Warner Lee Wells, Robert J. Lifton, George Rathjens, and Eugene Rabinowitch.

The Improvement of Instruments and the Growth of Scientific Ideas (28 Dec.)

Arranged by J. L. Heilbron.

John J. Beer, Albert VanHelden, Trevor H. Levere, Otto Mayr, and Stanley L. Jaki.

Non-Western Astronomy (28 Dec.)

Arranged by Nathan Sivin.

Lynn T. White, Jr., Bernard R. Goldstein, David Pingree, and Nathan Sivin.

Work in Progress I: Highroads of the Scientific Revolution (28 Dec.)

Arranged by J. L. Heilbron.

J. L. Heilbron, Nicholaus H. Clulee, William A. Shea, Betty Orvell, Stanislaus I. Dundon, Ronald S. Calinger, and Sabetai Unguru.

Work in Progress II: Mainly Modern Science (28 Dec.)

Arranged by J. L. Heilbron.

Lawrence Badash, Henry Small, Daniel Seeley, Richard A. Hart, Robert E. Kohler, Jr., Barry Gale, Robert E. Hall, and I. K. Kothari.

Science and Human Values: Thermodynamics, Information, Evolution, and Ethics (29 Dec.)

Arranged by Ralph Wendell Burhoe.

When science is being accused of destroying human values, and when the traditional values of all cultures of the world are in crisis and ill-adapted to changes brought about by science and technology, it seems appropriate to examine some recent contributions of the sciences that suggest that life's values arise out of and are integral with the processes of the physical cosmos and that the sciences may have uncovered a touchstone for ethics.

Two or three decades ago such men as A. I. Oparin, Erwin Schrödinger, and Norbert Wiener illuminated the

relation of life to the physical world—by showing rather specifically how life's origin, organization, and evolution arise out of the properties of molecules and of the world. These fruitful ideas rapidly evolved and received widespread empirical confirmation.

Of central interest are (1) the cybernetic mechanisms by which life's order or information is maintained, (2) the natural processes whose selection increases this information in molecular, biological, and cultural evolution in spite of the disordering processes prevailing in the environment, and (3) the widespread application of the same principles from the primitive levels of molecular behavior to the highest levels of human thought and culture. How many of these findings affect the prevailing Western myths that man is alone, alienated from nature, a freakish accident in an indifferent or inhospitable cosmos, and that the sciences are either neutral or destructive for human values? To what extent may these findings provide a ground for man's right or ethical choices?

Ralph Wendell Burhoe, Aharon Katchalsky, R. B. Lindsay, Van Rensselaer Potter, and Anthony F. C. Wallace.

Perspectives on Apollo History (29 Dec.)

Arranged by Loyd S. Swenson, Jr.

Contemporary history of space science, technology and exploration, sponsored by the NASA historical program as part of NASA's enabling legislation, is phasing from research into writing a series of monographs on various modules central to the moon-landing achievements of Project Apollo. These three sample narratives will direct attention to problems of contemporary scholarship as well as to basic elements of Apollo.

James Lee Cate, R. Cargill Hall, John S. Beltz, Loyd S. Swenson, Jr., and John M. Logsdon.

Recent Physical Science (29 Dec.)

Arranged by Paul Forman.

Erwin N. Heibert, Richard Berendzen, Stanley Goldberg, Paul Forman, and Gerald Holton.

Work in Progress III: Science, Scientific Institutions and Society (29 Dec.)

Arranged by J. L. Heilbron.

Harold I. Sharlin, Steven A. Shapin, J. Barry Love, Walter E. Gross, Harry W. Paul, Ralph W. Dexter, Frank N. Egerton III, and J. C. Cadieux.

Approaches to the Philosophy of Biology (30 Dec.)

Arranged by Dudley Shapere.

Dudley Shapere, Richard Lewontin, Arnold Ravin, Stuart A. Kauffman, William Wimsatt, Leigh Van Valen, and Kenneth Schaffner.

ENGINEERING (M)

Automobile Pollution (26 Dec.)

Arranged by Paul Rosenberg.

Automotive engines contribute significantly to the pollution of our atmosphere, especially in urban areas. This is an engineering problem of concern not only to the general public and the automotive industry, but also to Federal, state and local governments, as well as to environmental scientists, public health officials, medical specialists, and conservationists. This timely symposium seeks to answer such questions as: What pollutants are produced by automotive engines, in what quantities are they produced, and what is their contribution to the total pollution of our atmosphere? What is the present state of the art of anti-pollution devices for internal combustion engines, and what are the prospects for their future? What are the fuel producers doing to develop non-polluting fuels? What is the present state of the art of the electric automobile, and its future prospects? What is the status of the steam car (Rankine cycle engine)? What are the optimum short and long term solutions to the problems of automobile pollution?

Victor Wouk, Bernard Weinstock, John D. Caplan, Russell C. Mallatt, and William P. Lear.

Are We Winning the War against Urban Fires? (26 Dec.)

Arranged by Carl W. Walter.

Fires have taken an enormous toll of human lives and possessions since time immemorial. The increased complexity of urban life multiplies the potential hazards. This symposium will describe several important directions where new scientific and technological insights are beginning to have an effect to assure greater safety.

William J. Christian, James W. Kerr, Curtis Volkamer, Edward H. Blum, Carl C. Wilson, Perry L. Blackshear, Jr.

Education toward Social Responsibilities for Beginners (28 Dec.)

Arranged by T. Paul Torda.

Present-day engineering colleges, as they developed in this century under the influence of military and industrial establishments, established curricula and methodology best suited for technological training to fulfill the requirements of industrial and military needs. The engineering colleges have been successful in producing graduates who are eminently trained in perpetuating and further developing products and rendering services which contribute to the proliferation of technological waste. Where engineering colleges are sadly lacking is the imbuing of professional attitudes and ethical strength in engineering students. We can raise the question legitimately whether radical changes in the attitudes of graduate engineers and in their education would not be necessary. An affirmative answer is a must and this immediately establishes the need for radical changes in engineering colleges which will lead from *technological training* to *professional education.*

T. Paul Torda, Grant L. Hansen, Daniel C. Drucker, Walter S. Owen, G. J. Rath, C. W. N. Thompson, George Bugliarello, Jimmie E. Quon, James P. Hartnett, and Leonard Link.

MEDICAL SCIENCES (N)

The Importance of the Bioanalytical Laboratory in Health Care (27 Dec.)

Arranged by Edmond L. Morgan.

The role of the Bioanalytical Laboratory in the "New Health Care of the 70's" will be stressed at this all-day

symposium—its role in control of environmental pollution, the use, capabilities, calibration, limitations, and proper utilization of practically all instrumentation now in use in the clinical laboratory—through the use of an excellently prepared slide presentation plus a side presentation and demonstration of the newest concept in Mutiphasic Health Screening—the Computa-Lab Module. This instrument is a compact, computerized, portable module capable of screening four to seven patients per hour at relatively low cost and utilizing a minimum of laboratory personnel.

Edmond L. Morgan, Irwin H. Sommerfeld, Lewis W. Mayron, and Robert G. Martinek.

Educational Needs for Careers in the Health Professions (28 Dec.)

Arranged by Maurice L. Moore.

The symposium will have the general purpose of bringing together information on the current needs for various professional personnel in providing health care, the current educational programs being offered in the various areas, and a discussion of an effective advisory program in operation. Recent evidence indicates that the students and premedical educators in the colleges should be better informed and made more aware of the changes taking place in the delivery of health care and the modifications in educational programs to provide the large number of trained personnel needed for this care. The expanded roles of dentistry, nursing, and other allied health professionals as associates on the health team with the physician will be reviewed. The efforts to increase the number of minority group students and the role of students in changing today's health educational programs will be presented. All of this discussion will serve as a basis for providing more effective advisory programs in the colleges for the interested students.

Norman F. Witt, William J. Grove, Lloyd Ferguson, W. Randolph Tucker, Viron L. Diefenbach, William J. Hilton, Edward S. Peterson, Mary Kelly Mullane, Ruth M. French, Richard Kunske, LeRoy P. Levitt, Lawrence H. Baldinger, and Frank Whitehouse, Jr.

Advances in Human Genetics and Their Impact on Society (28 Dec.)

Arranged by Digamber S. Borgaonkar and Saleem A. Shah.

Recent advances in human genetics have provided information and procedures which have far-reaching implications and consequences for society. Applications of innovative scientific and technologic procedures create new contexts for the balancing of conflicting societal and individual interests. Due to recent publicity about certain genetic findings there appear to be pressures aimed at formulating social policy before clear and sound scientific data are available. The nature of such scientific developments and their significance for social policy and programs requires that society at large be informed about these developments and participate in the making of important decisions. The resolution and handling of these complex and pressing social issues should involve meetings of both scientific and legal thought.

Clair E. Terrill, Digamber S. Borgaonkar, Kurt Hirschhorn, Neil MacIntyre, Saleem A. Shah, Nathan Hershey, and Elyce Zenoff Ferster.

Problems in the Meaning of Death (29 Dec.)

Arranged by Leon R. Kass.

The old problems of death and dying are acquiring a new sense of urgency, thanks to dilemmas created by the growing powers of medicine to preserve and prolong life. Excessive population growth and the plight of the aged call attention to the fact that death control is not an unmixed blessing. Sophisticated machinery for resuscitation and maintenance aggravates the physician's difficult problem of ministering to the human needs of the dying patient. Ironically, the success of mechanical devices in forestalling death has introduced confusion about the proper definition of clinical death. How we deal with the practical problems of death and the dying patient will depend upon how we think about death, about life. Conversely, our basic attitudes and ideas will be influenced by the prevailing practices of physicians attending the dying and by the work of medical scientists at the borders of life and death. This symposium will explore both these theoretical and practical matters: it will consider different ideas about life and death, and will examine how these ideas affect and are affected by medical and scientific practice. It will be a "work-in-progress," public meeting of an interdisciplinary task force of the Institute of Society, Ethics, and the Life Sciences which is conducting a three-year investigation into various problems in the meaning of death.

Daniel Callahan, William F. May, Elisabeth Kubler-Ross, Robert S. Morison, Henry K. Beecher, Renee C. Fox, Martin P. Golding, Leon R. Kass, Joseph A. Mazzeo, and Paul Ramsey.

Biocybernetics of the Dynamic Communication of Emotions and Qualities (29 Dec.)

Arranged by Manfred Clynes.

Recent work is making it clear that precise brain programs exist for the dynamic expression and communication of emotion which are genetically preserved and display a lawful character. The precise spatio-temporal shape of expressive gesture, tone of voice, touch forms as well as musical phrases and dance steps are seen to depend on a common brain algorithm, for a particular emotion (sentic state) to be expressed.

Through concepts and methods developed by Dr. Clynes, it has become possible to measure the specific internal space-time forms associated with emotional expression. These forms, called essentic forms, act like spatio-temporal keys in the data-processing locks of our brain. The communicative power (in the present moment) is a form function, being greater the more faithful it is to the "pure" inner command shape. Particular choices of output of the control system may be culturally conditioned but not, apparently, the essentic form.

In this interdisciplinary symposium differential mathematical equations describing the essentic forms will be presented. The solutions represent the dynamic forms of the expression of specific emotions. Identity and recognition of qualities and emotions will be adumbrated through the process of recognition at various levels of existence: the physics of relationship (of fundamental particles), cellular recognition processes, organic and brain functions. Cross-cultural aspects and aspects relating to the language of music will be presented.

The inherent need for the precise natural expression of essentic forms is discussed. Therapeutic results obtained with sentic cycles, a programmed sequence of essentic form production by the individual, will be presented, indicating possible freeing from alienation and psychosomatic symptoms.

Manfred Clynes, Otto H. Schmitt, Alexander Alland, Sam Rose, William C. Parke, Philipp Naegele, Bernard Riess, and Aristide H. Esser.

The Chemistry of Learning and Memory (30 Dec.)
Arranged by William L. Byrne.

The past year has yielded a series of apparently significant and somewhat surprising developments in the chemistry of learning and memory. The controversy surrounding the "memory transfer" field may be further developed or partially resolved by new studies which include transfer experiments with new types of learning, further evidence of specificity, and the isolation of biologically active peptide from the brain of trained animals.

William L. Byrne, Arnold M. Golub, Ejnar Fjerdingstad, Stanislav Reinis, Georges Ungar, Otto L. Wolthuis, Jean M. Daliers, Gotz F. Domagk, John H. Levan, and James A. Dyal.

DENTISTRY (Nd)

Neuropsychology of Feeding (28–29 Dec.)
Arranged by Robert C. Likins.

The study of feeding behavior has played an important role in the development of modern physiological and psychological concepts of brain mechanisms. Recent advances in this field have resulted from a multidisciplinary approach by psychologists, physiologists, and nutritionists among others. The present symposium highlights some of the biological bases of feeding regulatory mechanisms and their influence on behavior.

Clarence Cohn, Alfred E. Harper, Quinton Rogers, Edmund T. Rolls, Matthew J. Wayner, J. L. Falk, David A. Levitsky, Saul Balagura, John Garcia, Peter Ridley, Wanda Wyrwicka, Aryeh Routtenberg, and Robert D. Myers.

PHARMACEUTICAL SCIENCES (Np)

Vice Presidential Address (28 Dec.)

Speaker: Don E. Francke.
Pharmacy Practice in Denmark and Switzerland.

Distinguished Lecture (28 Dec.)

Speaker: Ray E. Brown.
Delivery of Health Care in the United States.

Marine Pharmacology and Toxicology (29 Dec.)
Arranged by John Autian, Joseph P. Buckley, and Gary P. Carlson.

Gary P. Carlson, W. Fulmor, G. E. VanLear, G. O. Morton, R. D. Mills, P. R. Burkholder, J. S. Webb, Yuzuru Shimizu, B. Prescott, M. L. King, G. Caldes, C. P. Li, M. M. Sigel, W. Lichter, L. Wellham, A. J. Weinheimer, Edgar J. Martin, William R. Kem, Toshio Narahashi, Jerome F. Siuda, Yukio Tanaka, Stanley C. Skoryna, Jerry F. Stara, Findlay E. Russell, C. Y. Kao, Morris H. Baslow, and Edward J. Schantz.

Pharmaceuticals, Detergents and the Skin (30 Dec.)
Arranged by Joseph B. Jerome.

Naomi M. Kanof, Guinter Kahn, J. E. Jelinek, Paul Lazar, Donald J. Birmingham, and R. Owen Carter.

AGRICULTURE (O)

Agriculture and the Quality of the Environment in the Seventies (28–29 Dec.)
Arranged by Matthias Stelly and Michael A. Farrell.

The symposium will consist of four parts. The first part will focus attention on the uses of various chemicals in agriculture. Adverse effects on environmental quality and beneficial contributions to human welfare will be noted. The future role of agricultural chemicals will be discussed. In the second session, efforts of agricultural scientists to reduce, or totally avoid where possible, the uses of chemicals by the development and employment of an ecosystem approach to pest control and environmental quality will be discussed. The importance of waste disposal and waste utilization will be emphasized in a third session. The role of agriculture as relates to environmental quality and various types of waste and waste utilization and disposal problems will be given due attention. Finally, the last session will picture agriculture in the total environment. Here we will see developed the broad interrelationships between man's sustenance requirements in terms of food, fiber, and shelter and his aesthetic and diversional needs exemplified by open spaces, forest land, clean air, clear water, and the natural beauty in his environment.

Robert White Stevens, Matthias Stelly, Lewis B. Nelson, B. E. Day, R. L. Metcalfe, D. C. Torgeson, George L. McNew, R. E. Larson, H. W. Johnson, G. F. Sprague, R. G. Dahms, E. F. Knipling, J. V. Osmun, A. A. Hanson, W. W. Armistead, Borislav J. Stojanovic, M. V. Kennedy, F. L. Schuman, Raymond C. Loehr, H. E. Besley, M. R. Soderquist, T. C. Byerly, O. G. Bentley, R. Keith Arnold, Henry T. Skinner, Paul E. Waggoner, and L. M. Glymph.

INDUSTRIAL SCIENCES (P)

Past Vice Presidential Address (28 Dec.)

Speaker: Gordon K. Teal.
Technology and Human Potential.

Industrial Approaches to Urban Problems (28 Dec.)
Arranged by Jordan D. Lewis.

The recognition of opportunities for new techniques and technology traditionally has provided sufficient incentive for industry to pursue these opportunites on its own. And where industry has not taken the initiative, government has usually been able to provide it through economic incentives. Yet while industry as producer and supplier of hardware and government as consumer will participate in the solution of urban problems, such as housing, solid waste management, education, and transportation, they have approached these problems with measured restraint. This attitude stems from the realization that urban problems are

dominated by economic, labor, political, and social troubles and that, to succeed, new urban technologies must be accomplished by and responsive to solutions to these human problems. Industry and government must therefore take a new initiative in surmounting the urban crisis.

An examination of the key issues is clearly an important step along the route to building a more viable urban society. The symposium "Industrial Approaches to Urban Problems" will explore the human and technical problems a city faces in the pursuit of improved urban housing, solid waste management, education, and transportation.

Jordan D. Lewis, Harold B. Finger, Lewis W. Hill, William G. Rosenberg, Norman Wakefield, William Sidell, Charles G. Gunnerson, Myron D. Calkins, Frank R. Bowerman, David Bushnell, Paul Briggs, Verne Atwater, Michael Michaelis, James D. Braman, Jr., Howard Ross, and C. Harry Broley.

EDUCATION (Q)

The Association of Academies of Science (27 Dec.)

Arranged by Harry J. Bennett.

Glenn W. Stewart, J. Dudley Herron, Wilmer W. Tanner, Frank W. Starr, John R. Mayor, and Paul DeHart Hurd.

Humanizing Learning in Science (27 Dec.)

Arranged by Phillip R. Fordyce.

Is the human being characterized by a tendency toward learning? Does man possess an innate curiosity about his environment? Is he self-actualized in the pursuit of the understanding of his environment?

We are faced with the nuclear problem, the population problem, and the environmental problem. Are these evidences of our failure to facilitate natural development of the humane behavior of man? Are coercive approaches to science teaching compatible with humanistic science learning? Are the pressures of instructional operant conditioning opposed to humanizing learning in science? What characterizes a humanistic program in science education?

These questions will be addressed through presentation of a position paper by a philosopher which will be reacted to by a physicist, a biologist and an educator.

Arthur Livermore, Walter Watson, C. J. B. MacMillan, Claude Welch, and Norbert Weinstock.

Individualizing Instruction in College Science Courses (27 Dec.)

Arranged by George H. Ziener.

The increasing number of college students as well as pressures for open enrollment are forcing a reassessment of college science courses. As a result, both curriculum content and presentation methods are undergoing change. A large number of these new approaches are based on individualized instruction. A true individualized instruction program is the result of a systematic approach to the needs of the individual student. Because of the pragmatic nature of this approach, a theoretical approach is of less value than examination of actual programs. The strengths and weaknesses of these operating programs will provide the basis for identifying critical factors in the development, implementation, and administration of individualized instruction programs. Emphasis will be on the common characteristics of these programs and translation to other academic areas. The process of individualizing college courses rather than the specific equipment used is the most important part of any individualized program. It is this process that offers one means of meeting some of the growing pressures on college faculty and administration.

George H. Ziener, Edwin B. Kurtz, Jr., Joseph D. Novak, and Phillip Pennington.

International Science Education (27 Dec.)

Arranged by Phillip R. Fordyce.

This symposium will present a spectrum of thinking on international education through presentations by a global organization, a government agency, and a major private foundation, concluding with an interesting description of innovation in higher education that is being conducted in England.

David Lockard, Harold Foecke, Lloyd G. Humphreys, K. N. Rao, David Hawkridge, and Garland E. Allen.

Search for "Purpose" in Nature and in Living Systems (27 Dec.)

Arranged by V. Lawrence Parsegian.

To what extent (if any) do trends and constraints that characterize natural processes in the physical and biological world represent purposes of nature? Do these natural trends and purposes constitute a meaningful framework within which to consider the role and purposes of man and of man's society?

V. Lawrence Parsegian, Abraham S. Luchins, Robert J. Baum, William H. Johnson, Louis Gold, Thomas W. Phelan, John M. Koller, and Charles W. Wortham.

Nature Study and Conservation Education for Ecological Empathy (27–30 Dec.)

Arranged by John I. Green.

Ruth L. Scott, William J. Beecher, Stanley B. Mulaik, Richard J. Baldauf, John I. Green, William Lunt, John Gustafson, Paul V. Webster, Loren S. Woerpel, Douglas Wade, Paul Gunlock, James Zimmerman, and Marion Hall.

The Teaching of Science (28–29 Dec.)

Arranged by Arnold W. Ravin.

In the contemporary climate of opinion the public is losing confidence in the intrinsic "good" of science and in the extent to which scientific "progress" can contribute to the solution of mankind's most pressing problems. The loss that science is suffering in the public eye is already detectable in the growing antiscientific attitudes being expressed by high school and college students, by the decrease in numbers of students entering certain fields of science, as well as by the indecision and ambivalence being expressed by federal and state legislators for the further support of science and technology. The reaction of scientists to this radical and abrupt change in public opinion is predictable. On the one hand, many scientists regard the contemporary public outlook on scientific activity as unjustifiedly pessimistic and marked by fundamental flaws in understanding the motivations, rationale, and control of scientific inquiry. On the other, such lack of understanding that the general public exhibits is evidence of a failure of the processes by which science communicates with society.

In this light, the scientist is naturally reconsidering his role as teacher, since teaching is the principal way by which

he communicates with the social community of which he is a part. As teacher, the scientist not only has the opportunity to transmit current understanding of natural phenomena, how it was acquired, and what possibilities it offers to man's social and cultural progress, but he also gains the vital opportunity to become familiar with social and individual needs, desires, and frustrations as expressed by the broad spectrum of students he serves.

The scientist is more concerned than ever with such questions as: In what ways are we failing to project a true image of the scientific enterprise? In what ways are we failing to serve as teachers and communicators? Are there modes of communication between science and society that are not being effectively used? Are there new projects for science teaching being planned or under way that deserve greater attention? This symposium will deal with these and related questions. There will be two sessions at which speakers will address themselves to subjects related to these themes and answer questions posed by members of the audience. In addition, a session is planned in which the entire panel of speakers will have an opportunity to exchange views, comments, and ideas with other guests and interested members of the audience.

Arnold W. Ravin, Jay Lemke, Garland E. Allen, Frederick Reif, Milton Hildebrand, Benson R. Snyder, David Hawkridge, Herman T. Epstein, Adolph Baker, and Philip Hoffman.

The Learner and His Future Environment: Perspectives (29 Dec.)

Arranged by Mary Keegan and Irwin Siegelman.

Public school education has become characterized in recent years by illuminating bursts of innovation in practice. In most cases, innovative educational change has resulted from an empirical response to the obvious—administrative changes in scheduling practices to accommodate heavy enrollments, for example—or to the intuitive—many of the programs resulting from the science course content improvement studies. There have also been some highly innovative changes that are based on valid research findings on how children learn. In fact, there are likely to be many more of the latter changes that will come in the future to alter irreversibly the public image of public school education.

Today there are many places in this country where the public school environment—the formal learning environment—is very different from "the way it used to be." But what might the future hold; or what *should* the future hold if public schools are to fulfill their fundamental responsibility to provide in large, if not in total measure, a learning environment in which the innate potential of each child to develop into a contributing member of society is properly nurtured?

Irwin Siegelman, Carl Bereiter, Jerome Abern, Ida Mae Fletcher, Michael Johnson, Frank Temmerman, Marie R. Veazey, David Weinberg, Om P. Puri, Henry Rogers, Grayson Walker, Joseph Wise, William P. Thompson, Mary Keegan, Mark R. Shedd, and Clifford E. Swartz.

An Undergraduate View of Science Education—1970 (29 Dec.)

Arranged by Frederic B. Dutton.

Four seniors, one in mathematics, one in physical science, one in chemistry, and one in physics, who have spent many hours debating the merits of present undergraduate education in the sciences with their classmates and faculty, will present some critical issues as they and their contemporaries view them. Their concerns will include increased opportunities for independent study; more concern for science as a human activity and cultural entity; greater instructor involvement as interpreters of knowledge and significance and less as purveyors of information; and great dissatisfaction with present systems of grading, examinations, and degree certification.

Frederic B. Dutton, Cristine A. Clifford, Donald L. Durack, Michael C. Grebner, and Don A. Howard.

Program and Cases of United Science and Mathematics for Elementary Schools (30 Dec.)

Arranged by Earle Lomon.

E. L. Lomon, Kathleen Garner, Nancy Lofton, Irving Morrissett, Lois Johnson, Lambros Pappas, Thatcher Robinson, Charles Donohoe, Estelle Stuart, Michael Godfrey, Norbert Salz, and Louise Buckner.

INFORMATION AND COMMUNICATION (T)

Science Literature for Children (27 Dec.)

Arranged by Eugene H. Kone.

Raymond J. Seeger, David Dietz, Ruth Moore, Kenneth K. Goldstein, Theodore Berland, and Judith E. Randal.

The International Sharing of Scientific Information (28 Dec.)

Arranged by Scott Adams.

New communications technology has created both opportunities and problems for the traditional international information exchange functions in the sciences. As a consequence, in recent years questions relating to the provision of scientific and technological information have been elevated to the level of national science policy on the one hand, and to the attention of intergovernmental and nongovernmental scientific organizations on the other.

This Symposium will report on the recommendations made by the Joint ICSU–UNESCO Feasibility Study of a World Science Information System (UNISIST) which are to be considered by an Intergovernmental Conference in the Fall of 1971, and OECD sponsored studies of the informational requirements of governments for their scientific, technological and economic development. Recent developments in international cooperation in the establishment and operation of sophisticated information systems serving the sciences will also be presented.

Harrison Brown, Jean Claude Gardin, Lewis M. Branscomb, and Burton W. Adkinson.

Dynamic Changes in Biomedical Communications in the Seventies (29 Dec.)

Arranged by Abe Rubin.

N. Henry Moss, Charles Roland, Henry Simmons, and Joseph T. Engle.

Excellence in Scientific Writing (29 Dec.)

Arranged by W. Earl Britton.

W. Earl Britton, Benjamin F. Hammet, John W. Young, Richard Lewis, and Harry B. Benford.

STATISTICS (U)

Uses of Statistics in Operations Research (26 Dec.)

Arranged by John E. Walsh.

Many aspects of operations research involve uncertainty, both in the occurrence of random events and in lack of information about important parts of operations. Statistical methods can be very useful in making direct (probabilistic) allowance for random occurrences and in reducing difficulties from shortage of information. In some cases, the operations research may be based almost entirely on experimental results. In other cases, statistical considerations may be restricted to some specific aspects. Also, some investigations are concerned with operations involving substantial detail while others deal with simplified situations where appreciable aggregation has occurred. These various kinds of cases receive consideration in one or more of the four reports on research that are given. As virtually always happens, new statistical methods, or new adaptations of existing methods are needed. That is, standardized statistical methods are seldom directly usable for the specialized and complicated situations that ordinarily occur for operations research applications.

H. O. Hartley, George E. Nicholson, Jr., Lawrence L. Schkade, and Marcel F. Neuts.

Statistical Problems of Resource Management (30 Dec.)

Arranged by Douglas G. Chapman.

The emphasis on proper management of the environment and of our natural resources focuses attention on the need to approach these problems quantitatively. This session is arranged to summarize the present situation in several important areas of resource management, both as to the quantitative developments made so far and to suggest the problems now being attacked.

Kenneth D. Ware, Gordon M. Kaufman, Michael Goldberg, and Douglas G. Chapman.

ATMOSPHERIC AND HYDROSPHERIC SCIENCES (W)

Systems Approach to Environmental Pollution (27–28 Dec.)

Arranged by George K. Chacko.

What the ORSA program hopes to contribute is specific discussion of what systems approach can and cannot do to identify, formulate, model, solve, and implement the solutions to the problem of environmental pollution.

Three are sessions devoted each to water pollution, air pollution, and solid waste. The purpose of the sessions is not to raise the litany of systems approach as the answer to all problems. Instead, the emphasis will be directed to what it can and cannot do for specific problems. To ensure focused discussion around the respective topics, the Presidential Commission Report *Restoring the Quality of our Environment* (The White House, November 1965) will be used as the point of departure.

Each session will have two principal papers. The first one will address itself to the broad scope of the water pollution, air pollution, or solid waste problem, and discuss specific methods of systems approach that have already been applied, those that can be applied, and/or those that cannot be applied. (e.g., Systems approach to the implementation of the Air Quality Act of 1967.)

The second one will address itself to the narrow scope of the water pollution, air pollution, or solid waste problem, and discuss specific methods of systems approach that have already been applied, those that can be applied, and/or those that cannot be applied. (e.g., Systems approach to reducing the automobile emission by 25 percent in five years.)

Each session will have two principal discussants. The first one will be a practitioner at the federal, state or regional level. His concern will be to challenge the validity of the theoretical approaches presented in the two principal papers, and to raise the thornier problems of implementation.

The second one will be by a performer on a pollution contract from the federal or state government or regional authority. His concern will be to assess the applicability or otherwise of the theoretical approaches at the macro and micro level which will be presented in the two principal papers.

Rolf A. Deininger, Chia Shun Shih, Walter A. Lyon, Richard F. Thomas, John H. Ludwig, Kay H. Jones, Dario R. Monti, William Sanjour, Bennett C. Manning, Ellison S. Burton, Joseph Palombo, Richard B. Engdahl, John C. Liebman, P. H. McGauhey, William Matuszeski, Kenneth A. Hekimian, Richard S. Greeley, William D. Rowe, Roland Younghans, Lee M. Talbot, and Donald O'Connor.

Lake Restoration (29 Dec.)

Arranged by Robert A. Ragotzkie.

The feasibility of restoring a lake which has deteriorated in quality due to excessive fertilization and/or pollution by toxic substances is the general problem to be addressed. There is considerable question whether this can be accomplished by (1) cutting off the supply of undesirable materials at the source (2) treating entire tributary streams, or (3) treatment of the lake itself.

The problem could be conceived as "limnological engineering." The economic, social, and esthetic costs must all be considered in any call for action.

Robert A. Ragotzkie, A. F. Bartsch, W. T. Edmondson, Charles Powers, T. E. Maloney, G. Fred Lee, Clifford H. Mortimer, Arthur Pinsak, David Anderson, Victor Arnold, and S. Fred Singer.

Water Supply and Water Management Problems of the Great Lakes (30 Dec.)

Arranged by Max A. Kohler, William C. Ackermann, and L. A. Heindle.

The general purpose of the Symposium will be to provide for wide interdisciplinary consideration of water management problems of the Great Lakes region, with emphasis on the requirements for scientific studies. Present uses and management practices will be described and proposed schemes for optimizing use of these important resources in the future will be discussed. Institutional arrangements for developing and managing international waters will also be considered. As part of the International Hydrological Decade, the United States and Canada are currently planning an International Field Year on the Great Lakes—a major research program which is to begin in January 1972. The symposium will provide an excellent forum to discuss this major scientific effort of the two countries.

William C. Ackerman, David C. N. Robb, Lyle E. Craine, E. Roy Tinney, David F. Witherspoon, James P. Bruce, William J. Drescher, T. Lloyd Richards, Benjamin G. DeCooke, and Stanley A. Changnon.

AAAS ANNUAL MEETING

26–31 December 1970, Chicago

Registration badges will be required for admission to all sessions, except for a few special programs to which the public will be invited.

ADVANCE REGISTRATION FORM

Mail to: American Association for the Advancement of Science, Dept. R, 1515 Massachusetts Ave., NW, Washington, D.C. 20005

☐ Enclosed is $10 Registration Fee (*Program* and Convention Badge)

☐ Enclosed is $15 Registration Fee (including spouse) (*Program* and Convention Badges)

☐ Enclosed is $5 Student Registration Fee (16 years and older) (*Program* and Convention Badge)

☐ Enclosed is $5 for the *Program* only AAAS Member ☐ Nonmember ☐

(Mailing date of Program and Badge—1 December)

NAME: _____
(Last) (First) (Middle Initial)

MULTIPLE REGISTRATION: _____
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HOME ADDRESS: _____
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INSTITUTION OR
COMPANY AFFILIATION: _____

_____
(City) (State) (Zip Code)

CONVENTION ADDRESS: _____

Office and Session Locations

Conrad Hilton: AAAS Headquarters Office; AAAS Registration Desk; AAAS Lecture Aides; AAAS Television Room; AAAS Press Headquarters; AAAS Council Meeting; AAAS Exposition of Science and Industry; AAAS Commission and Committee Symposia (Commission on Science Education); AAAS General Science Symposia ("Mood, Behavior and Drugs"; "Man's Impact on the Global Environment"; The Teaching of Science"; "Techniques and Status of Modern Parapsychology"; "Is there a Generation Gap in Science?"); AAAS Sections—A-Mathematics; C-Chemistry; FG-Biological Sciences; H-Anthropology; I-Psychology; N-Medical Sciences; Nd-Dentistry; Q-Education; American Society of Zoologists Office; Sigma Delta Epsilon Office.

Sheraton-Blackstone: AAAS Invited Lectures (RESA Annual Address and Panel Discussion); AAAS Committee on Council Affairs (Open Hearing); AAAS General Science Symposia ("Science and the Federal Government—1970"; "Science and Man: Values and Expectations"; "Crime, Violence, and Social Control"; "Contributions of U.S. Minority Groups to the Development of Science"; "Women in Science"); AAAS Sections—H-Anthropology; K-Social and Economic Sciences; L-History and Philosophy of Science; P-Industrial Sciences; T-Information and Communication; U-Statistics.

Pick-Congress: AAAS Invited Lectures (Special Lecture; Distinguished Lecture; Sigma Xi-Phi Beta Kappa Lecture); AAAS Science Film Theatre; AAAS Film Lectures; AAAS Commission and Committee Symposia (Commission on Population and Reproduction Control; Committee on Arid Lands; Committee on Environmental Alteration); AAAS General Science Symposia ("Public Policy for the Environment"; "Large-Scale Use of Defoliants"; "Scientific Organizations, War-Peace Issues, and the Public Policy Process"); AAAS Sections—B-Physics; D-Astronomy; E-Geology and Geography; FG-Biological Sciences; K-Social and Economic Sciences; M-Engineering; Np-Pharmaceutical Sciences; O-Agriculture; Q-Education; W-Atmospheric and Hydrospheric Sciences; Society for General Systems Research Office.

Field Museum of Natural History: AAAS Invited Lectures (Address of the Retiring AAAS President and following Reception; Frontiers of Science Lecture).

Adler Planetarium: AAAS Section D-Astronomy ("On Teaching Astronomy").

University of Illinois Medical Center: Alpha Epsilon Delta.

Essex Inn: Beta Beta Beta—Biennial National Meeting; Association of Academies of Science; American Junior Academy.

Ascot House: Beta Beta Beta—Biennial National Meeting.

HOTEL RATES*
(Per Day)

The American Association for the Advancement of Science will hold its 1970 Annual Meeting in Chicago, Illinois, 26–31 December. The AAAS registration desk will be located at the Conrad Hilton Hotel. The following hotels will be used for housing.

HOTEL	SINGLE	DOUBLE	TWIN	SUITES
1) Conrad Hilton	$15	$21	$21	$55 and up
720 South Michigan	17	23	23	
	19	25	25	
2) Pick-Congress	15	21	21	45 and up
520 South Michigan	17	23	23	
	19	25	25	
3) Sheraton-Blackstone	15	21	21	40 and up
636 South Michigan	17	23	23	
	19	25	25	
4) Essex Inn	15	21	21	45 and up
800 South Michigan	17	23	23	
	19	25	25	

*Illinois Room Tax, 6%; rates for suites: parlor plus one-, two-, three-bedrooms; $5.00–$8.00 additional charge for cots.

HOTEL RESERVATIONS FORM

Mail To: AAAS Housing Bureau, Chicago Convention Bureau, 332 South Michigan Ave., Chicago, Illinois 60604

(Reservations received after 13 December cannot be assured.)

CHOICE OF HOTEL: First_____ Second_____ Third_____

ROOM: ☐ Single ☐ Double ☐ Twin ☐ Suite Preferred rate $_____

NAME: _____
(Individual requesting reservation)

ADDRESS: _____
(Street) (City and State) (Zip Code)

ARRIVAL: Date_____; _____a.m._____p.m.

DEPARTURE: Date_____; _____a.m._____p.m.

Be sure to list definite arrival and departure date and time. Hotel reservations will be held *only* until 6 p.m. unless otherwise specified.

Number in party_____sharing this room will be (list name and address of each person, including your own):

_____

_____