AAAS ANNUAL MEETING

26–31 December 1968 • Dallas, Texas

• PERFORMANCE

In the Matter of J. Robert Oppenheimer
(A Play in Three Acts by H. Kipphardt)
Department of Theater, School of Fine Arts, Southern Methodist University

• EXHIBITS

The Circle of Knowledge
The Newberry Library, Chicago (*B. Wells*) and The Dallas Public Library

The Art of Organic Form
The Smithsonian Institution, Washington, D.C. (*P. C. Ritterbush*)

G. E. Hale Centennial Exhibit
The American Institute of Physics (*C. Weiner*)

Vibrating World
I. B. M. Galleries

Exhibit of Scientific Equipment and Books

• SCIENCE FILM THEATRE

Arranged by P. Morris (National Science Film Library, Canadian Film Institute)

Animals and Man: Challenge for Change; Cybernetic Serendipity; The Last Continent; Experimental Man; The Developing Countries; Foreign Films; Environmental Man.

• TELEVISION BROADCASTS

(To be shown on Channel 13, Dallas, and on the stations affiliated with the Eastern Educational Network)

New Developments in Educational Technology
Genetic Technology: Some Public Considerations
Global Effects of Environmental Pollution
Financial Crisis in Science
Technology, Living Cities and Human Environment
United States Science Policy
Earth-Oriented Applications of Unmanned Satellites
The Analysis and Communication of Biological Form
The Social Relevance of Physics

Informal Interviews

• SYMPOSIA AND DISCUSSIONS CONCERNED WITH THE PUBLIC UNDERSTANDING OF THE EFFECTS OF SCIENCE

Symposia and Discussions of Problems Affecting the Public
Reviews of Large Research Programs
Discussions of Interactions of Science with Other Human Activities

• CROSS-DISCIPLINARY SYMPOSIA CONCERNED WITH THE ADVANCEMENT OF THE CONTENT OF SCIENCE AND TECHNOLOGY

The lectures and symposia to be given at the 1968 AAAS Annual Meeting are summarized on the following pages.

Special Lecture I (26 Dec.)

Speaker: Loren Eiseley (Benjamin Franklin Professor, Anthropology and the History of Science, University Museum, University of Pennsylvania).

The Odyssean Voyage in Science and Literature.

"Begin with a journey," runs the adage of a famous editor. Since the days of Homer's *Odyssey* over two thousand years ago the public hunger for vicarious adventure has fed upon tales of travel. It is not sufficiently recognized, however, that the modern world of evolutionary science has been the creation of the great voyager-naturalists. The year 1968 marks the 200th anniversary of the voyage of the intrepid navigator Captain James Cook into the South Pacific—a voyage to be twice repeated before his death by violence in Hawaii in 1779. Cook and his accompanying naturalists were the first to penetrate across the Antarctic Circle as well as to voyage extensively in Polynesia and northward to the high latitudes of Bering Strait. Strangely, they and those who followed them repeat in reality what Odysseus' nineteen-year wanderings symbolically prefigured. Cook observed the Polynesian peoples in their as yet untouched Edenic isles. It was the country of Homer's Lotus Eaters in which men forgot their homeland and which persistently haunted them with nostalgic yearnings upon their return.

Later, in the nineteenth century, Charles Darwin in the Galapagos would glimpse the Circean powers hidden in that moon landscape. It was the power of time and isolation to transform, not just men, but all things living into wraiths and flitting shadows. Finally the novelist Melville in the valley of Typee would experience Odysseus' life with the nymph Calypso and voyage home to brood his life away as Odysseus must have done upon his return to barren, sea-girt Ithaca after the long enchantment of the summer isles.

Thus from Cook's 200-year old observation, onward to Darwin's deeper penetration of the Circean labyrinth of change, even to the great novelist's war with fate in the pages of Moby Dick or his final wanderings in the Holy Land, one grows aware of a pattern, a repeated pattern in both science and literature. That pattern consists of the great voyage of youth and discovery forecast symbolically in the Odyssey and repeated by each man who sought and found both insight and final disillusionment upon the chartless waters of the sea.

Special Lecture II (26 Dec.)

Speaker: Marshall W. Nirenberg (Nobel Laureate 1968; Chief, Biochemical Genetic Laboratory, National Institutes of Health).

The Genetic Code.

Frontiers of Science: Lecture I (27 Dec.)

Speaker: Patrick Suppes (Executive Head and Professor, Department of Philosophy and Director, Institute for Mathematical Studies in the Social Sciences, Stanford University).

Computer Technology and the Science of Curriculum.

This paper is concerned to discuss the possibilities for a science of curriculum and how such a science can be deepened by use of computer technology. An extended analytical example from elementary mathematics is discussed. The paper attempts to show how specific empirical parameters can be estimated from data and how the underlying model of the curriculum can be modified on the basis of empirical data in a systematic fashion.

Distinguished Lecture (27 Dec.)

Speaker: James A. Shannon (Special Advisor to the President, National Academy of Sciences).

Science and Social Purpose: First Principles for a National Science Policy.

Over the next decade, a general reordering of national priorities will strongly affect all science programs supported by the Federal Government. Whether those programs gain a high priority and take their proper place in the service of the Nation will depend largely on the efforts of scientific societies and institutions. The task of such programs is to lead and influence, and they should do so in the light of a broad science policy.

Such a policy must be grounded in certain basic principles. One is that our progress and strength as a nation have come to depend primarily on our intellectual capability. Two, this in turn depends upon a strong science base in higher education and in action programs. Three, the science base needs adequate support in stabilized institutions. Four, it needs a central locus of leadership, coordination, and responsibility. Five, this body must concern itself with general advancement of the "state of the art," which can only be accomplished through the support of science on a broad front. And six, a system of dynamic planning and programming must evolve to ensure the most effective and meaningful allocation of limited resources.

The Scientific Research Society of America (RESA) Annual Address and Panel Discussion (28 Dec.)

Arranged by Chauncey Starr.

Speaker: Athelstan Spilhaus (President, Franklin Institute, Philadelphia).

Technology, Living Cities, and Human Environment.

Panel Members: *Chauncey Starr, Thomas F. Rogers, R. G. Studer, and J. Erik Jonsson.*

Panel Discussion on the Financial Crisis in Science (28 Dec.)

Arranged by H. Bentley Glass.

H. B. Glass, H. Hollomon, P. H. Abelson, J. A. Shannon, and others.

George Sarton Memorial Lecture (28 Dec.)

Speaker: Owsei Temkin (William H. Welch Professor Emeritus of the History of Medicine, Johns Hopkins University).

Historical Reflections on the Scientist's Virtue.

Address of the Retiring President (28 Dec.)

Speaker: Don K. Price (Chairman of the Board, AAAS and Dean, John Fitzgerald Kennedy School of Government, Harvard University).

Purists and Politicians.

Review of United States Science Policy (29 Dec.)

Arranged by E. B. Skolnikoff.

This two-part symposium will be concerned with an evaluation of United States science policy and science policy machinery and with a discussion of the issues that should be brought into focus in the next Administration.

The first speaker, who was a member of the O.E.C.D. team of examiners that reviewed U.S. science policy in 1967 and early 1968, will present a critique based on their perspective from Europe and Canada. Dr. King will present a more general evaluation based on his many years of involvement in issues of science policy of concern to most Western nations. The morning session will be chaired by Dr. Herbert Hollomon.

The second session in the afternoon will have Donald Hornig as the primary speaker who will present his own views of current and future issues in U.S. science policy-making. This session will be chaired by Dean Don Price. Following Hornig's talk, there will be opportunities for questions from the floor that may be addressed to any of the panelists from the morning or afternoon session.

Herbert Hollomon, Conrad H. Waddington, O. M. Solandt, Alexander King, Don K. Price, and Donald F. Hornig.

Frontiers of Science: Lecture II (29 Dec.)

Speaker: Robert B. Livingston (Professor of Neurosciences, University of California at San Diego, La Jolla).

Neurosciences: Man's Most Valuable Frontier.

Convergence among several powerful neurosciences disciplines is producing a renaissance in what is perhaps the oldest field of human inquiry: how does the brain arrange sensory experiences, motor performances, and social communications and how does it provide the capacities for learning? In sensory and motor competence many other animals exceed human capabilities; the complexity of human social organizations are rivalled by organisms that have far smaller nervous systems; in learning we are often no faster and frequently less retentive than many other animals. It is more by the scope and freedom of opportunities throughout all of these categories that the human brain excells. This flexibility probably arises from internal neuronal activities relating to input and output signals. Such central neuronal activities would provide an ability to postpone immediate response in favor of internal trial of alternatives. They would provide escape from the explicits of the here and now. It is undoubtedly by formation of some such activity patterns—or images—that man enjoys flexibility and creativeness of response, his richest endowment for survival and well-being. Image formation accumulates according to past experiences of the individual. Images are of controlling significance in processes of perception, judgment, language and behavior; images are the main generating source of human behavior; they are the most critical factors on which the precariousness of human survival and other basic conditions of human life depend.

The thesis is developed that when man better understands the biological, psychological and cultural mechanisms affecting his perceptions and learning—the mechanisms of his image formation—he will have more substantial grounds than religious, political, and moral imperatives for empathy, tolerance, and tentativeness of judgment. He will gain more reliable means for predicting and shaping the social consequences of actions. He will be better equipped to cope with confrontations, individual and international. It is for practical as well as exciting human interest reasons that the neurosciences are conceived to be man's most valuable frontier.

There is a phylogeny of imagery and an ontogeny, the latter relating to the formation of individually ideosyncratic images. As yet, no one can trace image formation in the nervous system beyond certain rudimentary stages, yet there is no question that image formation will be readily enough understood in the near future to make a great difference in the potentialities for survival, in the character and impact of education, and in other far-reaching conditions affecting mankind.

Already some useful guidelines for understanding image formation are at hand, stemming from neuroanatomical, physiological, behavioral, chemical, pharmacological, and pathological investigations of sensory systems and of frontal-limbic-brain stem mechanisms instrumental in learning. Some of the specifics of current investigations of perception and learning will be recounted. The anatomical aspects of this discussion will be revealed by portrayal of the whole human brain in cinemorphology.

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

Speaker: Robert K. Merton (Giddings Professor of Sociology, Columbia University).

Behavior Patterns of Scientists.

Frontiers of Science: Lecture III (30 Dec.)

Speaker: John B. Calhoun (Unit for Research on Behavioral Systems, Laboratory of Psychology, National Institute of Mental Health).

Space and the Strategy of Life.

Space has value to life as a continuum which contains resources and provides experiences. Effective utilization of resources has culminated in the evolution of both aggressive defense of area and the formation of groups which share the same range. To the extent that an individual is alone when he experiences some aspect of his environment, he incorporates that item into his personality. The presence of others within his extended ego boundary may generate anxiety and produce defensive antagonism. This process of developing an identity with surroundings initiates the formation of a second kind of space within which we spend our lives. The experience of things becomes transformed into concepts about them until evolution produces a conceptual space in which values are related to relationships between abstract ideas

rather than to ways of behaving in relation to physical situations. The responsible choice among ideas forming one's conceptual space replaces the search for resources in physical space. Commitment to abstract values which guide action replaces aggressive defense of physical objects incorporated into one's ego. Compassion—the understanding support of others with differing values—replaces submission to aggressive action. Evolutionary progression tends to increase the time and energy devoted to conceptual space. Herein lies a partial solution to the population dilemma. Increase in numbers must cease within the next century. Nevertheless, evolutionary progression may continue through enlargement of conceptual space. Promoting enlargement of conceptual space requires increasing diversity of physical and ideational resources, kinds of living units, and assemblies they form, while increasing the number and effectiveness of links between these diverse elements and assemblies. Promotion in this sense will replace conservation as we—with compassion—guide the destiny of Earth toward creative exploitation of conceptual space through responsible commitments.

AAAS COMMITTEE SYMPOSIA

Unanticipated Environmental Hazards Resulting from Technological Intrusions (28–29 Dec.)

Arranged by W. Modell and R. E. Light.

Nothing has marked recent history more than the increase in man's ability to change aspects of the natural world. But these striking achievements in science are a mixed blessing. Under the pressure of modern technology and increased population, some of the changes in the environment, if extended, seriously threaten man's continued existence in that environment.

The list of environmental misadventures is long. The 1964 report of the AAAS Committee on Science in the Promotion of Human Welfare, "The Integrity of Science," attributed some of the environmental hazards to a tendency to make hasty applications of new technologies without investigation into the long-range effects on nature. This symposium is being convened to consider additional environmental problems that have become evident since the Committee report. The symposium will call to attention hazards that have developed from chemical interactions in the environment, including some that are the consequence of precipitous applications of technology, and some that might have been prevented by open consideration by interdisciplinary groups.

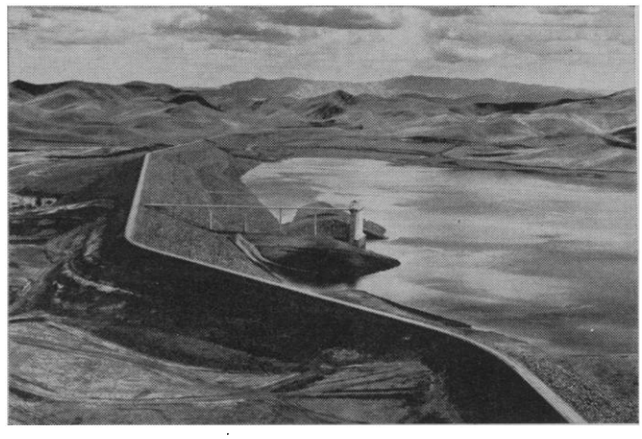
The symposium will illustrate that hazards occur in a wide variety of endeavors and in other countries as well as the United States. The symposium will explore methods to forecast and prevent serious environmental alterations. And, it will consider the need to bring relevant technical information to the public in order to help the community deal with the attending social issues.

Walter Modell, Robert E. Light, Margaret Mead, David Evans, Albert Sjoerdsman, Allan H. Conney, Fred Tschirley, Boysie E. Day, Rene Dubois, J. E. Smith, Evan Charney, I. J. Selikoff, Barry Commoner, and Edward A. Carr.

Water Importation into Arid Lands (30–31 Dec.)

Arranged by J. M. Bagley and T. L. Smiley.

Schemes which involve large-scale transfer of water between regions of surplus and regions of deficiency are being more commonly proposed. Such large-scale redistributions of water have potential for major and sustained impact on both exporting and importing areas. This symposium will bring together some of the best current thinking on the problems and possibilities associated with these large-scale transfers of water. Scholars and planners from the United States and Canada will consider the physical, economic, social, legal, ecological, political, and other facets of the large-scale export-import topic.



San Luis Dam and Reservoir in California. [J. C. Dahilig, Bureau of Reclamation]

Jay M. Bagley, Terah L. Smiley, Calvin Warnick, Edward Weinburg, P. H. McGauhey, Thadis W. Box, Gerald W. Thomas, Irving K. Fox, Charles W. Howe, Gale Young, Dean F. Peterson, Henry P. Caulfield, Jr., E. Roy Tinney, Emery N. Castle, Sol Resnick, Earnest F. Gloyna, Harvey O. Banks, and W. R. Derrick Sewell.

The Social Relevance of Physics (30 Dec.)

Arranged by A. M. Stone.

It has been widely reported that a feeling is prevalent, especially among the youth, that Physics has grown remote from the major social problems of today—purpose, personality, peril, and poverty. Another view, perhaps an unsophisticated one, is that Physics in most of its areas offers no great challenges, or, more precisely, where the great challenges lie, that they are so shrouded in abstraction that they repel rather than attract. Finally, progress is ineluctably accompanied by unpredictability and most people fear the latter and transfer this fear to the former.

These views, legitimate or not, deserve discussion and call for an appraisal because, like it or not, the clock cannot be reversed: Physics can no more be abolished than can literature and art. All must maintain their relevance to the culture of today and lead the way toward the culture of tomorrow. Only the means, the controls, the goals, the pace are in question. (This is part of Section B's program.)

Harvey Wheeler, Lewis M. Branscomb, Raymond Bowers, and Herbert H. Holloman.

Panel on Science, Technology, and Latin American Development (30–31 Dec.

Arranged by Harrison Brown.

This symposium will focus on the interdisciplinary approach to problems of economic development in Latin

American countries, particularly through the avenues which science and technology offer. With increasing attention being given to the importance of an adequate scientific-technological base for economic and social development and with the technological gap widening between Latin America and the more advanced countries, it is especially appropriate to discuss as many facets of the problem of development as possible.

The discussions will address themselves to immediate questions, such as food production and population growth, but will also raise fundamental issues such as: What is the role of science and technology in economic development? How much basic and fundamental research should be conducted and how are they to be balanced? How much should be invested by national governments and by private industry? What are the educational requirements for a scientific base? What are the social and political implications? What types of bilateral and regional scientific programs are possible?

The participants have all had personal involvement with such questions in Latin America and will lend a diversity of views and expertise to what is intended to be a comprehensive picture of the present situation in the region now under study.

Harrison Brown, H. F. Robinson, Harley Browning, Richard N. Adams, Theresa Tellez, Dwight Brothers, Victor Urquidi.

Goals for Dallas, Citizen Participation in Shaping the Future of a Major City (31 Dec.)

Arranged by B. D. Godbold.

Goals for Dallas is an innovative program in which thousands of citizens are setting goals for the Dallas area and then deciding together how and when each of the goals should be achieved. The goals cover government of the city, design of the city, transportation and communications, welfare, health, public saftey, elementary and secondary education, higher education, continuing education, recreation, cultural activities and the economy of Dallas.

The program started three years ago and the first stage—the setting of goals—has already been completed, with thousands of citizens taking part. The second stage—determining how and when to achieve the goals—is now underway. This stage includes identifying organizations, public and private, which should help achieve each goal, estimating costs, and projecting a timetable. Proposals for achieving the goals will be published in early 1969, and then reviewed in hundreds of citizens' meetings throughout the Dallas area. The proposals will be revised considering the suggestions voiced at these meetings.

Special emphasis is being given to acquainting citizens with the program, developing their interest and encouraging their participation.

Bryghte B. Godbold, J. Erik Jonsson, Louise Cowan, Zan W. Holmes, Clifford Nelson, Pat Y. Spillman, and Charles Sprague.

Genetic Technology: Public Considerations (26–27 Dec.)

Arranged by D. M. Singer.

The subject of the first session will be possibilities, purposes, and problems of genetic manipulation.

The second session will be introduced with a brief review of the existing methods by which public policy is made in health and science. The panelists and discussants will consider whether the existing governmental and scientific institutions are adequate to cope with the problems highlighted in the first session and, if not, what new institutions should be considered. Does the distinction between therapeutic and eugenic uses of genetic technology suggest that different types of controls should be considered? At what point along the continuum from the basic research laboratory to the physician's prescription blank should institutional regulation be imposed? What are the obligations of the investigator or society to the "mishaps" of experiments or applications involving genetic manipulation?

Although much of the discussion may be relevant to the developing techniques of organ transplants, that subject will not be treated as such.

In both sessions, the moderator and each panelist will speak for approximately 30 minutes. The balance of each three-hour session will be devoted to discussion. The moderator of each session will determine the extent to which the audience may participate directly in the discussion.

Current research in genetics is developing ideas and techniques that may make possible the manipulation of human heredity. The first session will be introduced with a brief overview of recent scientific advances, and of possible technological applications. The panelists will summarize the relevant scientific findings in their particular fields (e.g., synthesis of genes, cloning of identical individuals by nuclear transplantation, selection *in utero*); discuss the likely technological developments and difficulties and their therapeutic and eugenic significance; discuss the biological consequences of genetic manipulation on the fitness of the human genotype; consider the ecological consequences of alteration in the human genotype or gene pool.

The panelists and the discussants will together consider what kinds of genetic manipulation, if any, are necessary and/or desirable and why, and what therapeutic and eugenic goals should be sought. Some consideration of the ethical and social problems will necessarily be relevant.

Daniel M. Singer, Robert L. Sinsheimer, J. E. Seegmiller, Anthony Blackler, Marshall W. Nirenberg, David Schwarz, David Daube, J. E. Rall, Harold P. Green, Eugene B. Skolnikoff, David L. Bazelon, Rollin D. Hotchkiss, and Gordon M. Tomkins.

Sport and Its Participants (26–28 Dec.)

Arranged by P. Weiss.

This is an experiment in convergent thinking. The symposium will try to have sociologists, psychologists, physiologists, physical educationalists, medical researchers, and philosophers treat together a widely practiced and insufficiently studied area of human endeavor. The first session, devoted to an examination of athletic performance, investigates the physiology and psychology of the athletic performance, investigates the physiology and psychology of the athlete as it contrasts with that of other men. The second session concentrates on the distinctive kinds of conditioning required of participants in different sports. The regrettably neglected field of women in sports is dealt with in the third session—their aggressiveness, psychology, physiology, and personality. In the fourth session the psychology and sociology of sport is directly focussed on. Competition, team sports, the rules and roles of games are among the topics discussed. The

final session is devoted to the philosophy of sport, with particular attention given to the nature of the concept of the game, the actual phenomenon of sport, and the way in which sport and play occupy and qualify areas all their own.

Paul Weiss, E. Jokl, Erwin Strauss, J. J. Gruber, T. K. Cureton, William Heusner, C. E. Silvia, J. S. Councilman, J. Bosco, L. Welser, R. V. Ganslen, B. Rothemel, R. Pohndorf, P. Fardy, Warren R. Johnson, John P. Scott, Emma McCloy Layman, Celeste Ulrich, Bruce R. Fretz, Warren R. Johnson, Julia Ann Johnson, Thomas Boslooper, Abdel H. Ismail, E. James Leiberman, Marcia Guttentag, Gunther Lüschen, Ralph Stogdill, Gregory Stone, Richard E. Emerson, John M. Roberts, Gerald Kenyon, Brian Sutton-Smith, Paul Weiss, Robert Fogelin, Robert Ehman, Kenneth Schwartz, and James Keating.

Global Effects of Environmental Pollution (26–27 Dec.)

Arranged by S. F. Singer.

Until recently, man's interference with the environment around him has been fairly localized; but with the rapid increase in population, and particularly with the rapid increase in technology, in energy requirements and in the standard-of-living, certain environmental pollution effects have begun to assume global significance. One example is the measurable increase in the concentration of carbon dioxide in the atmosphere which results from the increased rate of burning of fossil fuels over the last fifty years. Another well-documented example is the widespread distribution of DDT which has now been found to occur even in penguins in the Antarctic. The worldwide increase in lead concentration in the oceans has been ascribed mainly to the anti-knock additives in gasoline used for internal combustion engines. It is therefore appropriate to examine at frequent intervals the problems which might be raised by these far-reaching effects and to discuss any possible deleterious consequences, which in many cases are quite difficult to judge. One of the purposes of the Symposium is to define "weak links" in the ecological network which will need to be carefully monitored. The Symposium can also provide a guide to show where further detailed research is needed and provide a guide for public policies which may be deemed to be necessary.

S. Fred Singer, Athelstan Spilhaus, John Buckley, Willard Libby, Bengt Lundholm, Roger Revelle, Walter O. Roberts, John C. Calhoun, Francis S. Johnson, Lawrence Marshall, Barry Commoner, Theodore C. Byerly, Vincent J. Schaefer, Perry Stout, Arthur D. Hasler, Jack Ruina, Reid A. Bryson, S. Manabe, Murray Mitchell, Edward Goldberg, George Woodwell, and Bostwick H. Ketchum.

Earth as a Planet (30 Dec.)

Arranged by F. Press.

The study of the earth in its planetary setting has undergone a revolution in recent years. Planetary probes, earth-based observations with optical and radio telescopes and radar have revitalized the study of the planets, their motions, radiation belts, atmospheres, surfaces, and interiors. Free oscillations of the earth, high pressure laboratory research, paleomagnetic and sea floor studies have led to startling hypotheses concerning the origin of surficial and deep planetary structures. Dynamic processes in the interior affect man destructively with the occurrence of earthquakes and volcanic eruptions and constructively through the concentrations of mineral deposits. Can control or prevention of natural catastrophes and better utilization of mineral resources follow from the new understanding of internal processes? Man has effectively intervened with many natural processes, both on a local and planetary scale. The consequences are not yet known and may be quite profound.

Frank Press, Thomas Gold, Wilmot N. Hess, Don L. Anderson, Mark Landisman, Harrison Brown, William B. Heroy, Jr., Mark K. Smith, Manik Tadwani, Charles Hedsley, Louis Pakiser, Eugene T. Herrin, Gordon J. F. MacDonald, and Anton Hales.

Space Applications: Earth-Oriented Applications of Unmanned Earth Satellites (28–29 Dec.)

Arranged by P. Rosenberg.

The space age has given us, among other benefits, the capability to establish instrumented platforms at orbital altitudes above the earth's surface. These platforms can provide real-time coverage of the entire earth, and are potentially useful for many practical purposes on earth aside from purely scientific utility. This AAAS General Symposium on Space Applications will consider the possible earth-oriented applications of these platforms and their practical benefits to mankind, keeping in mind the cost effectiveness of these applications. The Symposium is confined to unmanned satellites.

The areas of application which are considered in this Symposium are indicated by the titles of the papers in the first three sessions. The fourth and concluding session summarizes and discusses the applications, and considers some of their economic, social, national and international implications.

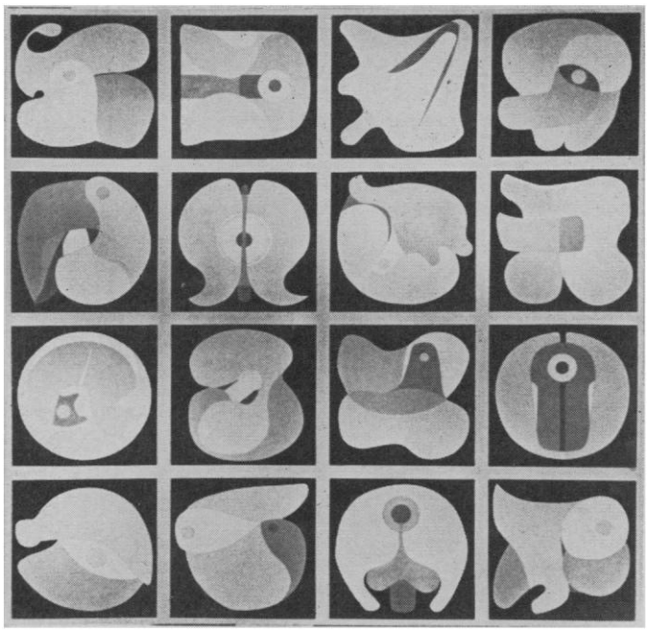
Almost all the speakers, panel members, and chairmen of this AAAS General Symposium were members of the 1967–1968 Woods Hole Space Applications Summer Study, under the chairmanship of Dr. W. Deming Lewis. The Summer Study was organized and conducted by the National Academy of Sciences and National Research Council under sponsorship of the National Aeronautics and Space Administration. Nevertheless the opinions expressed in this AAAS Symposium by the speakers, panel members, and chairmen are their own individually, and they are not necessarily the conclusions or opinions of the Woods Hole Summer Study, the National Academy of Sciences, the National Research Council, or the National Aeronautics and Space Administration.

Paul Rosenberg, Beardsley Graham, Richard B. Marsten, Henri G. Busignies, Thomas F. Malone, W. Deming Lewis, Allen Puckett, J. Ralph Shay, Eric A. Walker, David A. Landgrebe, Arthur J. McNair, Charles A. Lundquist, Verner A. Suomi, Paul Buck, Gifford C. Ewing, R. Keith Arnold, William W. Rubey, and Arthur G. Anderson.

The New View of the Origin of Life (29 Dec.)

Arranged by S. W. Fox.

The understanding of the origin of life has evolved from a negative outlook that prevailed following the historical experiments of Pasteur. The newer view can be dated from publication of the first theoretical treatments by Prof. Oparin in 1924. More recently, the concepts have been disciplined by laboratory experiments and geological considerations.



"New Symbolism," Takeshi Kawashima, one of 75 works of art exhibited in Smithsonian earlier this year.

Small molecules of biological significance, models of biological types of polymer and primitive cell-like structures have been produced in this context. Problems for the future will be discussed.

Sidney W. Fox, Barry Commoner, Alexander I. Oparin, John Oro, Philip H. Abelson, C. Ponnamperuma, Richard S. Young, and Gottfried Krampitz.

Art and Science: The Analysis and Communication of Biological Form (30 Dec.)

Arranged by Philip C. Ritterbush.

Among the most important early manifestations of the development of the scientific attitude were objective portrayals of the external morphology of organisms. The adoption of such naturalistic techniques of illustration seems to have followed upon a change in the esthetic objectives of artists in the thirteenth and fourteenth centuries. A second example of the influence of esthetic presuppositions on the science of biology arose in the early nineteenth century as biologists sought to advance from depictions of external morphology to discover internal fine structure and to elucidate the physical causes of form. The speculative *Naturphilosophen* of the time aspired to discover universally significant forms which were transcendental and ideal rather than objectively drawn from organisms themselves. This mode of inquiry had to be supplanted in favor of more objective studies of form. That change took place under the influence of scientists' preferences for concepts of organic form derived from a competing system of esthetic precepts. The formal esthetic principles implicit in the scientific concept of organic form in turn have greatly influenced the imagery and use of motifs in twentieth-century abstract art. Success in the elucidation of biological form still depends upon tactics of perception and analysis of principles of emergent order in complex living systems as they are studied by the modern embryologist and geneticist.

Philip C. Ritterbush, G. Evelyn Hutchinson, Gyorgy Kepes, and C. H. Waddington.

Art and Science: Will There Be a Difference? (29 Dec.)

Arranged by J. W. Kluver.

Examination of the interface between art and technology, beginning with the historical relationship and tracing developments up to the present time, when many contemporary artists undertake collaborative work with scientists and engineers to satisfy their growing need of understanding technology and working with it. The talk will also inquire into the various possibilities offered to the artist by industry and vice versa.

While many thinkers in recent years have been preoccupied with the differences between art and science and a need to bridge the gap between the two, artists and scientists themselves have many unanswered questions. This panel will examine these questions and will discuss the activities of the contemporary artist and scientist to find out at which point these activities meet and where and why they draw apart from each other.

J. Wilhelm Kluver, Henry Hopkins, Robert Whitman, Gyorgy Kepes, Elsa Garmire, and Jack Nolan.

MATHEMATICS (A)

Comparison of Einstein Theory of Gravitation and Observation (29 Dec.)

Arranged by A. H. Taub.

When the source of the gravitational field may be represented by a perfect fluid, the Einstein field equations which determine the metric tensor of space-time must be supplemented by an additional equation in order to obtain physically meaningful solutions. When this additional equation implies that the pressure of the fluid is a function of the energy density alone, the equations of motion of the fluid may be integrated to give various first integrals. These in turn imply that the Einstein field equations are derivable from a variational principle containing a Lagrangean function which depend only on the metric tensor. The first variation of this Lagrangean leads to the Einstein field equations. The study of the second variation enables one to determine criteria for stability of various solutions of the field equations.

Wallace Givens, L. I. Schiff, P. J. E. Peebles, Michael E. Ash, Dror Sadeh.

Third Annual Symposium on Some Mathematical Questions in Biology (27 Dec.)

Arranged by Murray Gerstenhaber.

The purpose of this series of annual symposia is to stimulate direct contact between biologists with some mathematical background and mathematicians. The majority of the speakers are biologists and will address themselves to questions which are primarily of biological interest, but in which some mathematical analysis is involved.

Richard Levins, Arthur Winfree, Jerome Y. Lettvin.

The Direction of Programming Languages for the Scientist (27 Dec.)

Arranged by Stan Shannon.

The purpose of the session will be to bring together a panel of individuals who have been involved in high level

computer program language development to discuss current developments in program language design and the impact of these developments on scientific computing. The question of "special purpose" versus "general purpose" languages will be explored. The panel will also address themselves to the question of what the next general purpose computing language will be. Will PL/I really replace FORTRAN? The scientists in the audience will be encouraged to express their views.

Robert M. McClure, R. F. Rosin, J. C. Browne, Christopher Shaw, Richard Hamming, Jean Sammet.

Mathematics Education (27 Dec.)
Arranged by William K. McNabb.

The National Council of Teachers of Mathematics will meet in a joint session with the American Association for the Advancement of Science, with the Greater Dallas Council of Teachers of Mathematics as the host organization. Mrs. Lois Crawford is the chairman of local arrangements. The material presented will have general appeal to those interested in elementary and secondary school mathematics.

W. T. Guy, Jr., E. Glendine Gibb, James G. Anderson, William H. Johnson, Stanley E. Ball, Marie S. Wilcox, George Grossman.

PHYSICS (B)

Physics Education for the General Public (29 Dec.)
Arranged by R. N. Little and Stanley S. Ballard.

This symposium should be of interest in view of the increasing technological level of our society. Physics education in Texas is at a crossroad. Only about half of the already small number of physics teachers prepared in colleges find their way into secondary-level classrooms. High-school enrollments in physics are declining and 95% of the physics majors in college have taken high-school physics. A state-wide program of collaboration between colleges and high schools is being undertaken to improve physical science offerings. Attention is being focused on the 9th grade, and earlier. The goal is to create a corps of well-trained, enthusiastic teachers of physics and physical science. During the last decade new curriculum materials have been developed, but preparation of elementary school teachers has not kept pace and the materials are not being used to full capacity. New programs for training elementary science teachers are necessary. Professor Holton reports on a new curriculum for high school physics that has finished an evaluation period of several years and is now going into wide use. Dr. Ballard's talk will serve to integrate the components of these problems, will comment on some college-level problems, and will show how these and other developments affect the topic of the symposium.

D. A. Cowan, B. T. Slater, R. N. Little, Addison E. Lee, Gerald Holton, Stanley S. Ballard.

Bioengineering and Cabin Ecology (30 Dec.)
Arranged by W. B. Cassidy.

This symposium will present a scientific evaluation of life system technology associated with man's health and safety in space. The academic approach to training professional bioengineering personnel, industry's method of incorporating bioengineering skills into the design of their products, and the laboratory's technique for evaluating these products have resulted in significant improvement and reliability of life supporting systems. Performance degradation resulting from man's separation from his normal environment and his exposure to artificial environments will be discussed.

Experience gained from the development and operation of ecological systems for underwater vehicles has been beneficially applied to the design of space cabin ecological systems. The design of ecological systems involves a trade-off between the physiological requirements and acceptable safety standards. Results of this trade-off are reflected in current life support system configurations and will influence the systems of the future.

Alfred Mayo, John Jacobs, Jack Kraft, Alfred I. Sibila, S. F. Singer, J. Gordon Wells, S. B. Sells, B. Thompson, William F. Arndt, C. F. Gell.

CHEMISTRY (C)

Lectures on Special Topics in Chemistry and Related Fields (26–27 Dec.)
Arranged by Ralph L. Shriner.

William B. Smith, Bruno J. Zwolinski, Morton E. Jones, Curtis C. Harlin, Jack K. Jeans, Daniel Banes, John A. Hogg, Karl Folkers, Peter R. Girardot, Harold C. Urey, David M. Kiefer, Aaron J. Ihde, Reese V. Jenkins.

ASTRONOMY (D)

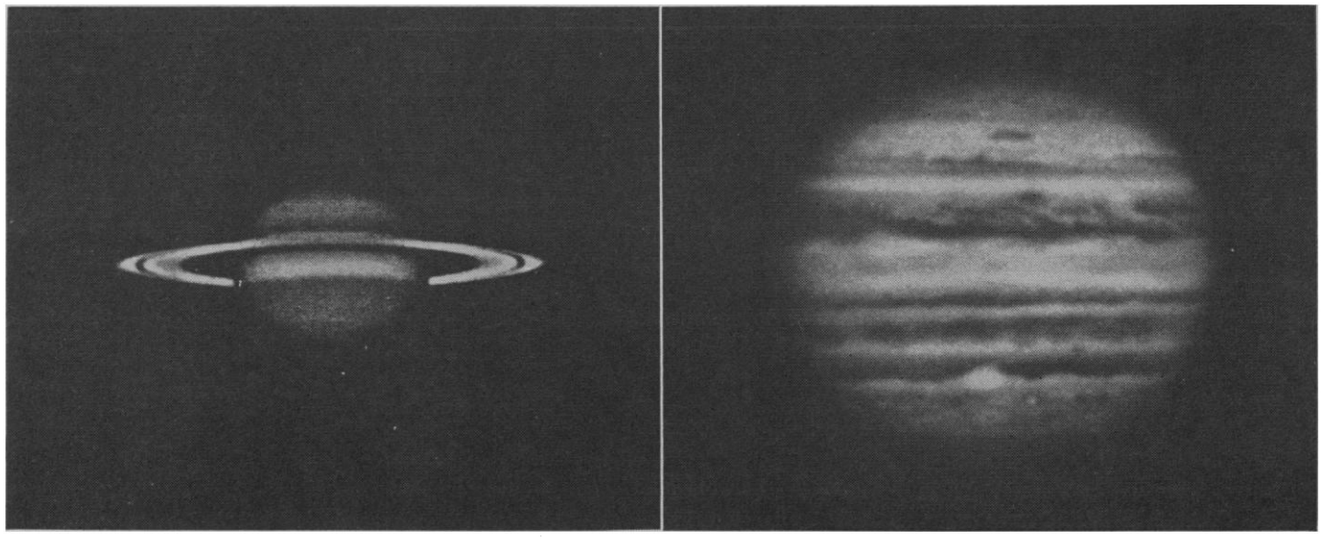
George Ellery Hale Centennial Symposium—Perspectives on 20th Century Astronomy, Astrophysics, and Scientific Institutions (27 Dec.)
Arranged by Charles Weiner.

Nicholas U. Mayall, C. Donald Shane, Ira S. Bowen, I. Bernard Cohen, Lee A. DuBridge, Bengt Strömgren, Robert Howard.

In connection with the Symposium a special historical exhibit on Hale's life and work, prepared by the American Institute of Physics Center for History and Philosophy of Physics, will be on display at the Sheraton-Dallas Hotel during the Dallas Meeting.

Jupiter and the Outer Planets (29–30 Dec.)
Arranged by Tobias Owen and Carl Sagan.

Recent observations of the spectra of Jupiter, Saturn, and Uranus have indicated that large amounts of hydrogen are present in the atmospheres of these planets, in general agreement with the composition of models calculated for their interiors. These results tend to support the idea that some of the outer planets may have retained the elemental abundance ratios that existed in the original solar nebula. Studies of the atmospheres of these planets may therefore be expected to provide detailed information about the composition of the material from which the solar system was formed. Furthermore, such investigations have obvious significance for



Saturn and Jupiter

studies of the origin of life on Earth, since the environment in which the critical early steps in this process occurred may have been very similar to present conditions in the atmosphere of Jupiter and possibly some of the other major planets. Thus, there is a special incentive for efforts to determine the compositions of these atmospheres and for theoretical and experimental investigations of chemical reactions that may occur among the constituents. In addition to these larger questions, there are a number of problems of high intrinsic interest to be discussed. Examples include the radiation balance of the major planets, the possible existence of a tenuous atmosphere on Pluto, the general circulation of the Jovian atmosphere and its relation to observable cloud motions, and the nature of Jupiter's Red Spot.

Edward B. Jenkins, M. J. S. Belton, and Uwe Fink, John S. Lewis, Tobias Owen, Gerard P. Kuiper, Guido Münch and Robert Younkin, Seymour L. Hess, Gerard P. Kuiper, Wendell C. Demarcus, Carl Sagan, Cyril Ponnamperuma.

Pulsars (30 Dec.)

Arranged by F. D. Drake.

The symposium will have the general purpose of presenting the observations on the pulsars as they are then known, and to compare these data with the outstanding theories regarding the nature of the pulsars. It is now known that the pulsars possess two pulsational periods, one of the order of seconds and approaching a constant value to a degree which challenges our observational abilities. The other is of the order of ten milliseconds and is slightly variable. The pulses themselves show large fluctuations in times less than 100 microseconds. These results give a strong indication that extremely dense neutron stars are the source of the pulsars. There is increased evidence that clouds of dense plasma move at high velocities close to the pulsars. The estimated distances to the pulsars have grown to values approaching the galactic radius; this implies that the energy source in the pulsar and the radio emission mechanism are remarkably powerful and efficient. We seem to glimpse very complicated phenomena in a new state of matter. It is intended that there will be four speakers, two to describe the observational data, and two to describe the pulsar theories.

F. D. Drake, H. D. Craft, Jr., K. S. Thorne, T. Gold.

GEOGRAPHY AND GEOLOGY

Antarctic Research (26–29 Dec.)

Arranged by Louis O. Quam.

The United States Antarctic Research Program (USARP) was established to follow up the Antarctic research carried out during the International Geophysical Year, 1957–58. USARP constitutes a national research program, administered, funded, and coordinated by the National Science Foundation as an expression of the country's interest in research opportunities afforded by the Antarctic. Under the terms of the Antarctic Treaty the United States has joined with 15 other nations in "ensuring the use of Antarctica for peaceful purposes only and the continuance of international harmony . . . on the basis of freedom of scientific investigations . . . as applied during the International Geophysical Year." Biology and geology, which received little or no recognition under the IGY, have become important parts of the USARP.

This symposium presents a series of research and review papers in the various scientific disciplines actively pursued under USARP. It seeks to highlight the contributions of Antarctic research to the solution of major problems on the frontier of science rather than describe the Antarctic program or the Antarctic itself. Following the introductory session, six scientific sessions will cover aspects of the upper atmosphere, the earth sciences and biological activities.

The scientific program on meteorology entitled "Cold Poles and Heat Balance" will emphasize the role of the major heat sink of the earth on the global circulation of the atmosphere. In a session on the upper atmosphere, documenting the unique advantage of the Antarctic in the study of electromagnetic phenomena and solar-terrestrial relations, emphasis is given to germane experiments conducted in both polar regions on conjugate phenomena.

The ecosystems of a harsh land and of a productive ocean provide biologists with challenging problems and unique insights into the adaptation of organisms to environment. The introduction will serve to bring out the overall activity of the United States biologists under the Antarctic program and the regional distribution of research. A survey of the principal classes of marine organisms with reference to their

distribution and relationship to Antarctic ecosystems will be followed by a discussion on primary productivity in Antarctic waters with reference to phytoplankton cycles and distribution. The terrestrial ecosystems will emphasize the ecology of the land vegetation. The biological session will conclude with a summary of research on birds and seals of Antarctica and of their role in the Antarctic ecosystem.

The Antarctic research vessels *Eltanin* and *Hero* and the Coast Guard ice-breakers provide the major platforms for oceanographic research in the Antarctic Ocean. The problems of the Antarctic polar front, or convergence zone, and of the origin of the cold, deep waters of the oceans are among the topics which challenge the oceanographer. The glaciology session presents new concepts on the length and nature of the Great Ice Age and features the potential for detailed deciphering of the climate of the past existing in a 7100-foot ice core recovered from a hole drilled to the bottom of the ice cap at Byrd Station.

The symposium will conclude with a discussion of new geologic, geophysical, and paleontological evidence for Gondwanaland and continental drift.

T. O. Jones, Laurence M. Gould, M. J. Rubin, Henry Van Loon, Heinz Lettau, A. P. Crary, Colin Bull, Chester C. Langway, George H. Denton, J. C. Crowell or L. A. Frakes, Martin Halpern, Paul Tasch, E. H. Colbert, J. R. Heirtzler, Paul Dalrymple, Paul Julian, Ray R. Heer, Jr., Robert A. Helliwell, James R. Barcus, G. C. Reid, T. Neil Davis, Charles R. Wilson, Martin A. Pomerantz, Mort D. Turner, Arnold L. Gordon, Henry Stommel, J. Bowen, Bruce A. Warren, Robert Elder, George A. Llano, Joel W. Hedgpeth, Sayed Z. El-Sayed, Emanuel D. Rudolph, Wm. J. L. Sladen.

Geography and Science (27 Dec.)

Arranged by Albert L. Fisher.

Joseph Sonnenfeld, Donald D. Brand, George F. Carter, James M. Goodman.

Environmental Geochemistry in Relation to Human Health and Disease (30 Dec.)

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

The environmental chemistry of rocks, soils, plants, and water of a geographic area may be causally related, either directly or indirectly, to the occurrence of animal and human diseases. The morbidity and mortality rates of many chronic diseases can be shown to have definite geographic patterns throughout the world.

The present state of our knowledge in the field of geochemistry, concerning the distribution of elements in various rock types of the substrate, the retention or dispersal of these chemical constituents during the process of weathering soils, their transport in water, and absorption by plants will be explored. The cycling of elements in a particular geologic framework creates a recognizable geochemical province. The variance from optimum levels of a particular element in plants and water of such a province is predictable and thus possible to compare with geographic differences in disease patterns.

Areas of deficiency as well as excess of F, I, Se, Mo, Mn, Cu, Co, B, Ba, Fe, Cr, Zn, P, Mg, and Ca are known to occur in sections of the United States and other countries throughout the world. Suboptimum levels of many of these elements are known to affect the health of animals and human beings. The effects of trace elements on human health and disease will be reviewed.

Harry A. Tourtelot, John S. Webb, Marvin W. Skougstad and Paul R. Barnett, J. F. Hodgson and W. H. Allaway, F. Earl Ingerson, Harry V. Warren, Fred N. Ward, Alfred T. Miesch, Arnold E. Schaefer, Herbert I. Sauer and F. R. Brand, R. Warwick Armstrong, Fred L. Losee, H. Mitchell Perry, Jr., Arthur Furst, Walter Mertz, Walter J. Pories.

Biological Studies in Texas and Mexican Caves (27 Dec.)

Arranged by Robert W. Mitchell and James R. Reddell.

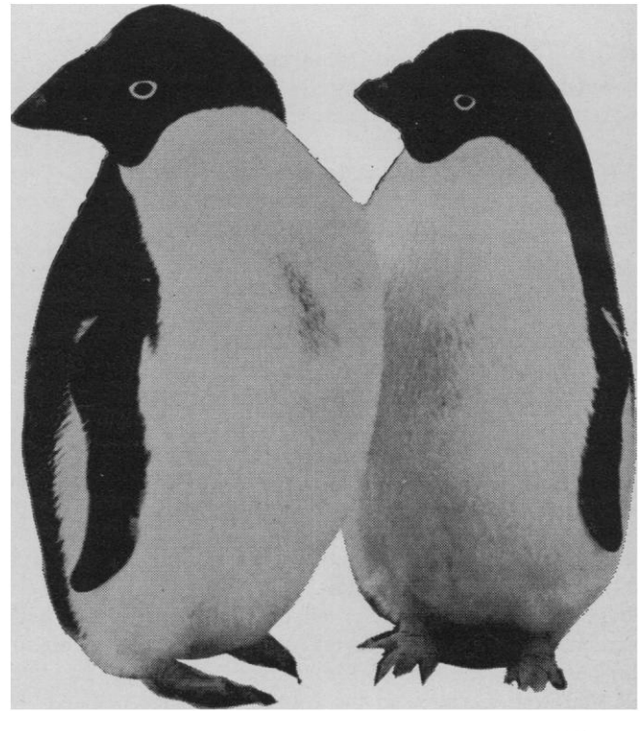
John R. Holsinger, Kenneth Christiansen and David Culver, Robert W. Mitchell, Clarence J. Goodnight, Charles Edwards, Nell B. Causey, A. B. A. Brink, J. E. Jennings, James F. Quinlan, Jr., John Fish and William H. Russell.

ZOOLOGICAL SCIENCES (F)

Whose Real World? (30 Dec.)

In attempting to relate the perceived world with the molecular world man interprets primarily, if not soley, in terms of the models of the world that are constructed on the basis of information generated by his own particular and personal sense organs. As sensory physiology extends its investigation to non-human systems, it becomes clear that there are other perceived worlds than ours. These worlds are superimposed. The relationship between diverse organisms that exist in the same molecular world but live in different perceived worlds cannot be understood solely in terms of their existence in the former.

Louis Delanney, Vincent G. Dethier.



The Physiology of Fighting and Defeat (28 Dec.)

Arranged by J. P. Scott and Basil E. Eleftheriou.

The symposium has the general purpose of bringing together current work on the biochemical and neurophysiological correlates of agonistic behavior in mammals. Recent work indicates that both fighting and defeat produce striking changes in both the levels of blood hormones and brain biochemistry. Such experiences also have effects upon the testis and accessory sex glands, although it is not yet clear how much this affects sexual behavior and reproduction. At the same time there have been many advances in the analysis of fighting behavior through brain stimulation and ablation. Evidence indicates that brain areas which evoke different kinds of aggressive behavior are highly specific. Of particular importance are Delgado's experiments with brain stimulation of monkeys in social groups. These findings have relevance to the theoretical issue raised by Scott; namely, that there appears to be no centrally arising stimulation for fighting behavior but rather that the central mechanisms serve to magnify and prolong the effects of external stimuli.

R. Plotnik and J. M. R. Delgado, K. E. Moyer, J. P. Flynn, F. H. Bronson, P. G. Bourne, C. Desjardins, A. S. Welch, B. W. Robinson.

Cytogenetics of Fishes (27–28 Dec.)

Arranged by Clark Hubbs.

The symposium will have the purpose of bringing together recent work on cytological and genetic analysis of fishes. This area has undergone extensive investigation from people trained in diverse areas.

Robert Behnke, Robert R. Miller, Eugene F. Hester, William F. Childers, Klaus D. Kallman, Lauren R. Donaldson, T. C. Hsu, Ray Simon, Paulette Setzer, Susumu Ohno, T. R. Chen, Alfred W. Ebeling, Franklin L. Roberts, B. L. Turner, Kazuo Fujino, George J. Ridgway, William Hershberger, William J. Morrison, James E. Wright, Richard K. Koehn.

The Interface between Organismal and Population Biology (29 Dec.)

Arranged by Howard A. Bern.

Howard A. Bern, Donald Kennedy, Peter Marler, Paul Ehrlich, Peter Hochachka, Richard Levins, Roger Payne, Frank A. Pitelka.

Cellular Aspects of the Control of Color Changes (29 Dec.)

Arranged by Ronald R. Novales.

Color changes occur as a result of the activities of chromatophores. In most animals, these are highly specialized pigment cells, but in one group, the cephalopod molluscs, they are tiny organs! Since chromatophores are controlled by hormones and/or nerves, the study of color changes contains many examples of hormonal, nervous and drug actions at the cellular level. In addition, although birds and mammals do not undergo rapid color changes, the control of their pigment cells, the melanocytes, offers further examples of the hormonal control of pigmentation as well as the role of genes and radiation in the control of color.

The symposium will provide a summary of current views on the organismal aspects of color changes, about which a great deal is known. However, it will emphasize the possible mechanisms by which hormones or nerves bring pigment movements within chromatophores (physiological color changes) as well as the means by which the synthesis and breakdown of pigments are controlled (morphological color changes). Among the numerous recent advances which have helped to shed light on these problems, the following might be mentioned: elucidation of the chemistry and ultrastructure of pigments, the comparative enzymology of tyrosinase, the discovery of microtubules in teleost fish melanophores, electrophysiological studies of chromatophores, the possible role of cyclic adenosine monophosphate in the control of melanophores by melanocyte-stimulating hormone, specific ionic requirements for chromatophore stimulation, the possible similarity between the epidermal melanophore and the mammalian melanocyte, the indirect nature of the action of luteinizing hormone on the avian melanocyte and the description of the vertebrate epidermal melanin unit. These are in addition to the well-established findings regarding the chemistry of many of the hormones regulating color changes.

The symposium should also be of interest to investigators in related areas for several reasons: many of the hormones and drugs affecting pigment cells have important effects on other tissues, such as nervous tissue; final understanding of the true nature of malignant melanoma in man may depend upon a better understanding of the control of melanophores and melanocytes; and finally, a fuller understanding of this one aspect of the biology of pigmentation may be of help to a more thorough understanding of some of the social problems arising from pigmentation in man.

E. Florey, M. Fingerman, R. Fujii, J. T. Bagnara, I. I. Geschwind, M. E. Hadley, W. Chavin, C. L. Ralph, W. C. Quevedo, Jr.

Turnover in Biological Systems (27 Dec.)

Arranged by R. J. Goss.

The transiency of life cannot be overemphasized.

In this symposium, recognized experts will explore the phenomenon of turnover in biological systems at various levels of organization from the molecule to the organism. Characterized by the perpetual synthesis and breakdown of molecules, organelles, cells, and tissues, living things are in a constant state of flux, a state which must be maintained in precise balance if death or disease is to be avoided. It is in this perspective, therefore, that selected systems in living organisms are to be examined in detail with a view to probing the mechanisms by which the delicate equilibrium between construction and destruction are held constant—and what happens when this regulation breaks down.

To this end, Dr. Joel Rosenbaum of Yale University will address himself to the problem of how the flagella of protozoans draw upon a reserve of prefabricated proteins to renew their substance, and even to regenerate completely following their amputation. Along similar lines, Dr. Heinz Herrmann of the University of Connecticut will explore the kinetics of protein synthesis in developing muscle fibers.

None of the body's tissues escapes the inexorable process of turnover, not even bone. Often regarded as one of the most stable components of the body, bone is in reality one of the most transient of all tissues, as Dr. Marshall Urist of the University of California at Los Angeles will testify. It is

the propensity for resorption here and deposition there that accounts for the skeleton's remarkable capacity to heal and remodel itself, a capacity which relies on subtle influences that dictate exactly where and when in the body ossification will be induced.

Numerous other tissues in the body undergo a relentless turnover of their cellular components. This renewal of cell populations, depending upon proliferation in a germinative zone balanced by equivalent deaths among their fully differentiated descendants, is an object lesson in steady-state control. Dr. Felix Bertalanffy of the University of Manitoba will discuss some of the general aspects of such problems.

Dr. Elizabeth Russell of the Jackson Laboratory is an authority on blood cell production. The phenomenal rate at which red blood cells are born and die—no less than two million a second in the human being—requires the operation of exquisitely precise regulatory mechanisms to insure that the number of circulating blood cells shall remain constant at all times. But when this balance is upset, as in certain genetic strains of anemic mice, one has a useful system in which to study the factors normally responsible for adjusting the input to the output.

No less important is the turnover of cells in the skin. Here there is a growth zone along the basal layer of the epidermis where cells divide. Some of the daughter cells resulting from these divisions then move up into the overlying layers of the epidermis where they manufacture quantities of insoluble keratin before dying and being sloughed off at the outer surface of the skin. By maintaining mice on diets deficient in essential fatty acids, Dr. David Menton of Washington University School of Medicine has upset the balance between birth and death among epidermal cells. Such animals produce cells faster than they are lost, and accordingly develop an excessively thick epidermis. By analyzing what has gone wrong under these experimental conditions, Dr. Menton seeks to understand how normal tissues maintain their status quo.

In this age of the impending population explosion, it is altogether fitting that we should know more than we do about the control of sperm production in the gonads. The meticulous investigations by Dr. Yves Clermont of McGill University on the kinetics of spermatogenesis are as important as they are timely. Stem cells lining the long, coiled seminiferous tubules of the testes give rise to sperm which require two months or so to reach maturity. Within each segment of the tubule, however, there is an orderly generation of sperm such that all of the cells in a given region differentiate in unison, but slightly out of phase from those in neighboring areas. Altogether, the process of spermatogenesis progresses in a wave propagated along the seminiferous tubule with remarkable precision. Dr. Clermont's pioneering research is leading the way to our understanding of how the production of sperm is controlled, not to mention the proliferation of the individuals they beget.

Indeed, it is the control of population of individuals that is the subject of Dr. Roger Milkman's address. By studying colonies of ascidians, which are among the most primitive chordates, he has found that new individuals are constantly being regenerated at one place while older ones are destroyed elsewhere. Yet each colony strikes a balance between regeneration and degeneration, and thereby maintains its dimensions within manageable limits. These creatures have solved the problem of population control. Finding out exactly how they do it is a challenging and important field of research.

R. J. Goss, Joel Rosenbaum, Heinz Herrmann, Marshall R. Urist, T. A. Dowell, and P. H. Hay, Felix Bertalanffy, David W. Bishop, Elizabeth S. Russell, David Menton, Yves Clermont, Roger Milkman.

Ecology and the Origin of Species (30 Dec.)

Arranged by Rezneat M. Darnell and Lawrence S. Dillon.

Marston Bates, Orie L. Loucks, Paul R. Ehrlich and Peter H. Raven, W. Frank Blair, E. Peter Volpe, Lawrence B. Slobodkin, John L. Hubby, David J. Merrill, Robert Selander, Masakazu, Donald W. Trinkle.

Penetration of Calcium Carbonate Substrates by Lower Plants and Invertebrates (29–30 Dec.)

Arranged by Melbourne R. Carriker, Edmund H. Smith, and Robert R. Wilce.

Research on the penetration of $CaCO_3$ substrates by lower plants and invertebrates is a relatively new field, and has made considerable progress in the last five years. This symposium is the first to be held on this topic. The symposium is intended (a) to demonstrate the broad phylogenetic spectrum of organisms which attack $CaCO_3$ skeletons of plants and animals and inorganic crystalline $CaCO_3$, (b) to examine new information on the structure of the substrates attacked and explore the chemical mechanisms of their dissolution by non-biological systems as a possible means to better understand how organisms carry out these functions, (c) to present newly acquired information on biotic mechanisms of penetration of these substrates and to inquire whether these organisms possess a common, or diverse means of chemical dissolution, and (d) to bring together the many investigators involved in this research from around the globe for an exchange of ideas through formal papers and informal discussions. Calcification by organisms is an important function especially in the sea, resulting in the accumulation of substantial amounts of crystalline $CaCO_3$. Dissolution of this by organisms undoubtedly contributes to the balance of calcium in seawater, and points to the importance of $CaCO_3$ penetrators in this recycling. Although not dealing with the destruction of vertebrate bone and teeth, the symposium should provide valuable information for comparison with the dissolution of these materials in vertebrates.

Dorothy F. Travis and Mary Gonsalves, P. E. Hare, V. R. Meenakshi, Iwao Kobayashi, Ricardo M. Pytkowicz, Yasushi Kitano, Nobuko Kanamori, and Akira Tokuyama, Barry Cameron, Adolph Seilacher, Alan P. Covich, Normal F. Sohl, Stjepko Golubic, E. Imre Friedmann, Harold Barnes and J. Topinka, Henry D. Isenberg and Leroy S. Lavine, Jan Kohlmeyer, John E. Warme and Neil F. Marshall, John W. Evans, William R. Cobb, Steven Obrebski, John D. Soule, Edward B. Cutler, Mary E. Rice, Howard H. Chauncey, James A. Blake, Sarah A. Haigler, Meredith L. Jones, Jack T. Tomlinson, M. A. McWhinnie, M. O. Cahoon, Sr., and R. Johanneck, John M. Arnold and Kristin Okerlund Arnold, Jerome Wodinsky, A. D. Ansell, and N. Balakrishnan Nair, Norman M. Hodgkin, T. F. Goreau and N. I. Goreau, T. Soot-Ryen, and C. M. Yonge, Edmund H. Smith, Miles A. Crenshaw and Jerry M. Neff, Gamil N. Soliman, Alan K. Craig, David K. Young, Doro-

thy F. Travis, Jennifer A. Day, Dirk Van Zandt, Marie U. Nylen, V. Provenza, Howard H. Chauncey, Anne Smarsh, Philip Person, M. Chétail and A. J. Rosenberg, Edmund H. Smith.

Functional Morphology of the Vertebrate Kidney (29 Dec.)

Arranged by Thomas L. Poulson and Thomas S. Parsons.

Thomas S. Parsons, Bodil Schmidt-Nielsen, Thomas L. Poulson.

The Use of Space by Animals and Men (29–31 Dec.)

Arranged by Aristide H. Esser.

The symposium provides an overview of the conceptualizations, methodologies, and actual research regarding the use of space by animals and men. Such a specifically directed attempt at summarizing knowledge from different scientific disciplines and different parts of the world has not been proposed before. There is probably also another reason why only recently such an ambitious approach to the particulars of spatial behavior could be undertaken: practically no naturally occurring behavior is restricted to one individual. This means that programs have to be developed to deal with behavior of all individuals in a group, and the behavior of a group as a whole. It is only with present electronic data processing methods and procedures that such a multifaceted approach has become possible; new conceptualizations have consequently arisen, thereby creating completely new ways of studying behavior. Bringing together investigators of widely different backgrounds, studying different animal species, and using a wide variety of scientific approaches will lead to a definition of basic guidelines for any future behavioral research.

Heini Hediger, Fred Fischer, Paul Leyhausen, Charles C. Carpenter, Robert Ardery, Kyle R. Barbehenn, J. LeGay Brereton, John H. Kaufmann, Kenneth P. Kinsey, Richard S. Peterson, John R. Tester, Glen McBride, Adam Watson, James A. Lloyd, Stuart A. Altmann, Edwin M. Banks, Halsey M. Marsden, Emil W. Menzel, Jr., Walter Sheppe, John G. Vandenbergh, Kenneth Myers, David E. Davis, Henri F. Ellenberger, Charles H. Southwick, John B. Calhoun, Frederick R. Gehlbach, Ulla Olin, Paul G. Pearson, Delbert D. Thiesen, Bruce L. Welch, Mario Von Cranach, Edward T. Hall, Irenaus Eibl-eibesfeldt, William A. Mason, Charles C. Carpenter, Daniel Carson, James Marston Fitch, David Lowenthal, Glen McBride, V. C. Wynne-Edwards, Irwin Altman, Robert Sommer.

Problems in Systematics of Parasites (27 Dec.)

Arranged by Gerald D. Schmidt.

Systematics of parasitic organisms is beset with difficulties which are partly due to the special conditions of the host-parasite relationship and partly to the unique characteristics of the organisms themselves. The accurate delineation of the species is complicated by such factors as hermaphroditism, polymorphism, host specificity, asexual reproduction, and the difficulties of *in vitro* cultivation of endoparasitic forms. Reduction and loss of organ systems hampers phylogenetic speculations, and the rarity of some species defies a statistical approach. It is the purpose of this symposium to show the current thinking of several specialists in the systematics of parasitic groups in hopes of clarifying some of the problems that exist and suggesting means to their solution. Problems considered include collection, literature, taxonomy, zoogeography, ontogeny, ultrastructure, genetics and metabolism, and morphology.

Wilbur L. Bullock, Marietta Voge, John L. Crites, Harold W. Manter, Norman D. Levine.

Systematic Significance of Vertebrate Brain Structure (27 Dec.)

Arranged by R. Glenn Northcutt.

The symposium will bring together systematists and neuroanatomists to recognize and discuss problems of current interest in these fields. The vertebrate brain has seldom been utilized as a taxonomic character, and the implications of brain studies for broader systematic problems have not been explored. An attempt will be made to describe some of the variation which exists among vertebrate brains, and the problems of application of brain studies to systematics will be discussed. Many systematists are not familiar with the variation that exists in vertebrate brains nor the consistency of patterns within certain groups. On the other hand, many neuroanatomists are not familiar with recent advances in systematics that play such an important role in understanding the evolutionary relationships recognized from detailed anatomical analysis. Thus, the interaction of representatives of these two disciplines should result in a meaningful exchange of ideas and information.

K. F. Liem, L. P. Woods, H. H. Hoffman, J. E. Heath, B. G. Bang, W. I. Welker, C. Welker, L. M. Radinsky, C. B. G. Campbell, C. Gans.

Marine Burrowing Organisms (27 Dec.)

Arranged by Bob F. Perkins.

The influence of marine burrowing organisms in sedimentary processes and in producing biogenic structures in a variety of modern environments has been demonstrated by neontologists and sedimentologists. Many of the sedimentary effects and structures resulting from the activities of marine burrowers are preserved in the sedimentary geologic record. The proper interpretation by paleontologists of these ancient features and the organisms which produced them depends upon an understanding of modern burrowing organisms and their activities. The purpose of this symposium is to summarize some of the work by neontologists, sedimentologists, and paleontologists on marine burrowers, their influence on the sedimentary environments in which they live and interpretation of their paleoenvironmental significance. New techniques for studying marine burrowers, the mechanics of burrowing and the resulting biogenic sedimentary structures have modified our understanding in recent years of the role of marine burrowers in modern environments and the interpretation of biogenic structures preserved in the sedimentary geologic record. Topics include the influence of burrowers on sedimentary processes, sedimentary structures produced by burrowers, shell form in relation to the burrowing habit in bivalves, burrowing mechanics of some crustaceans and other invertebrates, x-ray techniques for studying recent and fossil biogenic sedimentary features, and the paleoenvironmental interpretations of ancient burrower-produced sedimentary features.

Alan J. Scott, John E. Warme, Donald C. Rhoads, David Young, Steven M. Stanley, Eugene A. Shinn, James A. Howard, Robert W. Frey.

BIOLOGICAL SCIENCES (FG)

Biology and Society (27 Dec.)

Arranged by Paul DeHart Hurd.

The symposium will have the general purpose of exploring the interactions between biology, society, and education. These interactions will be examined by three recognized biologists who have special interests in "biology and society," but from separate points of view. One will examine the question from his special interest in philosophy, one from an historical perspective, and a third from the relevance of biological knowledge to the solution of certain social problems.

Edward Manier, Johannes Van Overbeek, Garland E. Allen.

DNA Content and Gene Multiplicity in Higher Organisms (30 Dec.)

Arranged by Clement L. Markert.

This symposium will be concerned with the quantitative variations in DNA content in different vertebrates and in different cells of the same vertebrate. Evidence has accumulated to demonstrate that the amount of DNA per diploid genome varies over more than 150-fold among vertebrates. The origin and functional significance of these widely differing amounts of DNA will be explored in the symposium. In addition, the variation in the amount of DNA per cell in a single organism will also be discussed with special reference to the amphibian oocyte in which it now appears that certain genes are extensively multiplied. This symposium should present some of the most recent information and current understanding of the structural arrangements and functional activity of the DNA of vertebrate cells.

Igor Dawid, Susumu Ohno, Jack Schultz.

Adaptations of Intertidal Organisms (27–28 Dec.)

Arranged by Charles M. Lent.

The intertidal zone is the ecotone between the marine and terrestrial habitats. Its inhabitants are exposed to a wide variety of physiological stresses concomitant to continual inundation and exposure: wide variations in salinity, desiccation, rainfall, oxygen availability, freezing, temperature, wave action, ice abrasion, and periodic food availability. In spite of these stresses, the populations are very dense.

It is the purpose of this symposium then to examine the adaptations which enable these organisms to survive under such rigorous conditions. The adaptations will be examined on several levels: biochemical-cellular adaptations, organismal-level adaptations, and behavioral-population adaptations.

This will be an attempt to unite the studies on the physiology, behavior, and distribution of the organisms of this interesting habitat. It is hoped that the discussions emerging from this symposium will shed light on this zone as a route for invasion of the terrestrial habitat and point out fruitful areas for future research.

Harold Barnes, Kenneth R. H. Read, Earl Segal, Richard C. Newell, Carl S. Hammen, Larry C. Oglesby, F. John Vernberg, Ernst S. Reese, Winona S. Vernberg, John Augenfeld, Jacques S. Zaneveld, Roger H. Green, D. Craig Edwards, Mario Pamatmat.

Physiological Ecology of Amphibians (29–30 Dec.)

Arranged by Victor H. Hutchison.

The symposium will have the general purpose of bringing together current work on physiological responses of amphibians to environmental changes. The amphibians, occupying the vertebrate evolutionary position of transition from aquatic to terrestrial existence, offer one of the most fruitful animal groups for study and eventual understanding of the evolution of physiological systems in diverse environments. A recent increase in interest in this field, as evidenced by the increasing number of investigators and publications suggests that this proposed symposium is both timely and appropriate.

O. A. Belkin, F. R. Gehlbach, L. L. McClanahan, M. R. Warburg, Bernard S. Martof, Francis L. Rose, Thomas B. Thorson, James A. MacMahon, Walter G. Whitford, Rodolfo Ruibal, Vaughn H. Shoemaker, Bayard H. Brattstrom, Harold A. Dundee, W. Frank Blair, Stanley Salthe.

BOTANICAL SCIENCES (G)

The Role of a Botanical Garden in a Modern University (28 Dec.)

Chairman: Donovan S. Correll.

Speaker: Warren H. Wagner, Jr.

What a "modern university" is is somewhat clouded by the current image of demonstrating students. Let us assume that peace will once again come, and that the modern university is a large educational and research institution which serves a wide variety of needs in society. Biological sciences seem to be undergoing changes in viewpoint over the past ten years. Science itself seems to be less popular among students than it was a decade ago, and in biology, students seem to be shifting their interests away from molecules and reductionist problems and toward questions of whole organisms and populations. Probably the outstanding subjects in biology in the coming years will be ecological in nature. Botanical gardens come in all shapes and sizes, of course. Many are devoted to research only, some entirely to public service, and others try to combine these functions. It seems a shame to have a purely research garden when, with a little additional effort, it can function as well for public service. I shall describe the University of Michigan Botanical Gardens as an example of the development and goals we are aiming for. There are several distinct functions: (a) basic research; (b) university teaching operations; and (c) public service. A good university botanical gardens should include all three. It is a center for research on a variety of problems at the organismal and populational levels. It provides the place where students can learn about plants, both in summer and winter, including such subjects as plant diversity, adaptation, and economic plants. Above all, the university botanical gradens can provide a much-needed bridge between the uni-

versity and the community in the form of public service—working with elementary and high school classes, providing a meeting place for citizens' organizations centered around botany, ecology, conservation, horticulture, and natural history, and a place where citizens can go and appreciate the beauty and interest of plants on their own. A university botanical garden can be a community asset of the highest order.

Grasslands of Southern Central North America (27 Dec.)

Arranged by Calvin McMillan.

An evaluation of the grasslands of central Oklahoma, central and southern Texas, and northeastern Mexico will be presented in this session of invited papers. Because these grasslands are rapidly being altered by man's activities, this current assessment should provide guides to future management.

J. Talmer Peacock, Gerald G. Raun, Elroy L. Rice, Donald A. Jameson.

Biosatellite II Experiment Results (28 Dec.)

Arranged by Joseph F. Saunders.

The Biosatellite II experiment results show convincingly that there is an interaction between radiation and one or more other factors encountered in space flight. The interaction varied between increasing the effects of radiation-induced damage to decreasing the effect slightly, but significantly. The set of plant experiments for the study of the biologic effects of weightlessness alone showed a close correspondence to results obtained by exposure to rotation on the clinostat. Additional studies of the orbited specimens are under way and may produce evidence of other significant effects of space flight. Post-flight laboratory control studies, in addition to those performed before and during flight, are being conducted in an attempt to clarify any ambiguities in the results as well as to reveal, possibly, important clues concerning those biologic mechanisms involved.

Orr E. Reynolds, Richard S. Young, John W. Tremor, Stephen W. Gray and Betty F. Edwards, Charles J. Lyon, Herbert M. Conrad, Richard W. Price, Donald R. Ekberg, Samuel P. Johnson, A. H. Sparrow and L. A. Schairer, I. I. Oster, Loulin S. Browning, Brenda Buckhold, R. C. Von Borstel and R. H. Smith, D. S. Grosch, F. J. deSerres and B. B. Webber, R. H. T. Mattoni.

ANTHROPOLOGY (H)

Physical Anthropology: The Search for General Processes and Principles (27 Dec.)

Chairman: Anthony Leeds.
Speaker: Gabriel W. Lasker.

Physical anthropology consists of two types of study: (i) the biological history of man and (ii) general biological processes in man (such as growth).

Popular interest may focus on the former: the fascinating story of the origin of man and of specific peoples. But the latter affords physical anthropology potential practical value in respect to medicine, dentistry, public health, and population policy.

The study of general processes is the study of human beings in particular situations, not for what we can learn about these particular populations, but for the sake of generalization about mankind anywhere in comparable situations. This is, of course, the purpose of experimental science in general. But in anthropology the method is usually comparative. Long ago the study of the growth of the two sexes and of children in different countries was started on a comparative basis and so was the study of the so-called secular change in adult stature. By 1911 Franz Boas had compared the change in stature and head form of children of several different immigrant groups in the United States. There have since been comparative studies of the amount and distribution of body fat (but not yet adequate comparative measurements of the relation of tissue components to diet and to diseases). Demographic patterns, inbreeding and outbreeding, and their effects are other general problems.

The Human Adaptability Project of the International Biological Program promises studies of human response to heat, cold, altitude, and other conditions on a wide international basis. If supported, these could turn physical anthropology's search in a useful direction. The functional biology of people of even out-of-the-way communities will be compared with each other. They can yield general statements concerning human response to types of ecological situation including such socio-cultural conditions as those of hunting-gathering tribes and urban slums.

Prehistory of the Nile Valley (26 Dec.)

Arranged by Fred Wendorf.

Until recently, virtually nothing was known about the prehistory of the Nile Valley. The now completed international campaign of archaeological salvage conducted in Nubia has focused attention on this area and a number of expeditions are now engaged in the study of the prehistory of the Nile from the Mediterranean to the headwaters in highlands of Central Africa. The general purpose of this symposium will be to summarize the data from this most recent work in this area. Much of this new information, as yet unpublished, promises to alter significantly our ideas about the role of Africa, and the Nile in particular, in the development of the Paleolithic of both North African and the Levant.

Roy L. Carlson, James L. Phillips, Joe Ben Wheat, Anthony E. Marks, Joel L. Shiner.

The Anthropology of Bone (27 Dec.)

Arranged by Edward I. Fry.

Although no one thing can be all things to all men, for the physical anthropologist, bone comes closer to doing the job than anything else. Traditionally, physical anthropology was concerned with bone because it was the only game in town, and was the only remnant he had of a past population. This led to countless measurements and observations of the external morphology of bone. Such studies produced masses of necessary descriptive material about bone but little understanding of process or function or even evolution.

In the 1950's, physical anthropologists began to look under the outer layer of bone—at its inner contents as well as its outer form. The experimental method was applied and gave new insights into the why of bone shape. Now we are studying bone as a dynamic material and at all levels of organization from the atomic to the organic, from the systematic to the evolutionary.

This symposium deals with many—not all—aspects of bone as studied by the physical anthropologist. This 1968 summary of our position should tell us where we have been, where we are, and point to where we are going.

J. L. Mathews, Mildred Trotter, Richard B. Mazess, John R. Cameron, James A. Sorenson, Francis E. Johnston, George J. Race, Claud A. Bramblett, Robert M. Malina.

Environment and Prehistory from Woodlands to Desert (28 Dec.)

Arranged by E. Mott Davis and Dee Ann Story.

The symposium will consist of a series of studies on environmental influences on prehistoric cultures in the changing area from the woodlands of Arkansas across the prairies and plains of Oklahoma and Texas to the desert of southwestern Texas and northern Mexico. Current archeological research throughout this area is increasingly emphasizing the ecological approach. These papers will summarize current knowledge of the interrelations of culture and environment in an area sufficiently varied to permit studies through space and time.

Frank Schambach, Michael P. Hoffman, George F. Carter, Reid A. Bryson, David A. Baerreis, Kenneth H. Honea, Vaughn M. Bryant, Jr., Charles Douglas, T. N. Campbell, Jeremiah F. Epstein, Charles R. Nance, Joel F. Shiner, Ernest L. Lundelius, Jr., Donald A. Larson.

Culture Contacts in the Southwest (29 Dec.)

Arranged by George L. Trager.

Culture contact, and acculturation by accretion and subsequent resystematization, has characterized the Southwest from prehistoric times to the present. The Chairman will introduce the subject by a brief historical introduction. The six papers will present details in their respective special areas. Brief comment and discussion will take place after each paper. The Chairman will summarize the presentations, adducing pertinent data from his own investigations at Taos Pueblo.

Ronald K. Wetherington, Edward A. Dozier, Felicia Harben Trager (assisted by William L. Leap), M. Estellie Smith, John J. Bodine, Thomas Maloney.

Ideology and Social Change in Latin America (30 Dec.)

Arranged by June Nash.

Clark Reynolds, Gilbert Merkx, Helen Safa, E. J. Hobsbawm, Frank J. Moreno, Anthony Leeds.

PSYCHOLOGY (I)

Compounding and Stimulus Selection and Classical Conditioning (29 Dec.)

Chairman: William E. Collins.

Speaker: Delos D. Wickens.

New information based on recent findings in several research disciplines will relate, in an integrated fashion, psychological, physiological, and neurological data to human performance at simple and complex tasks. Changes in psychophysiological responses as a function of certain characteristics of the performance-tasks and indications of excitatory and inhibitory physiological processes which occur during task-learning will be examined. The possibility of training subjects to detect self-behavior (on the molecular level) which is ordinarily observable only by instrumental means will be evaluated from the viewpoint of applying the methodology to such problems as myoelectric control of prostheses, motor rehabilitation of disabled persons, and even a finer tuning of precision in the performing arts. The influence of brain damage, personality characteristics, stress, sleep loss, and circadian rhythmicity in psychophysiological activity (such as EEG, heart rate, GSR, blink rate, body temperature, finger volume, pulse wave amplitude, basal skin resistance), information processing, ability to perform various tasks (e.g., vigilance, reaction time, tracking behavior, and simple sensory-motor tasks), and on short-term physical disease processes which induce performance degradation will be discused in detail.

Control of Human Behavior (29 Dec.)

Arranged by Delos D. Wickens.

This symposium reviews the application of behavior analysis to the control of human behavior. Models and techniques, largely derived from operant behavior procedures, are applied to human behavior in education, rehabilitation, and psychotherapy.

About twenty-five percent of institutionalized mental retardates have been reported to engage habitually in self-injurious behavior. In the past this behavior has been controlled by placing these retardates in strait jackets, sometimes for a lifetime. An alternate treatment, drawn from the experimental analysis of behavior, consisted of six successive programs which reduced self-injurious behavior.

In early education three related studies are reported which show modification of the syntax of spontaneous speech, the establishment of the correspondence between verbal and non-verbal behavior, and the improvement of the effectiveness of standard teaching procedures involving delayed imitation in culturally deprived pre-school children.

In psychiatry, the effectiveness of ward treatment techniques depends on the flow of information from the ward milieu to staff so that treatment procedures can be modified to shape patient behavior. Data indicate that the operant model and "point" economy treatment method provides a superior information system for direct measurement and feedback of patient and staff behavior. Information feedback to staff is discussed in terms of its effects on personal interactions between staff and patients.

An explicit program has been developed which eliminates stuttering in the laboratory and replaces it by rapid and fluent speech which carries over outside as well. Stuttering is treated as learned behavior which is maintained by its effects on others, and the implications of this approach are considered for other psychological problems, with regard both to their analysis and to suggested intervention procedures.

In higher education the application of operant procedures is illustrated by a description of an experimental college course designed to develop and demonstrate solutions to four major problems. These problems are (1) student achievement, (2) large student/faculty ratio, (3) the high cost of education, and (4) the common complaint that academic education is irrelevant to the world of affairs.

Mark F. Lewis, Lee Meyerson, Todd R. Risley, Arthur D. Colman, Israel Goldiamond, Richard W. Malott, Edward S. Sulzer.

Psychophysiological Correlates of Human Performance (29 Dec.)
Arranged by Delos D. Wickens.

William E. Collins, Richard I. Thackray, Norman T. Welford, Ralph F. Hefferline, Thomas W. Frazier, Neil Robinson Burch, Harold L. Williams, Orvis H. Rundell, Mary T. Spence, and Boyd K. Lester, Oscar A. Parsons, Robert Roessler, W. Dean Chiles.

Sensory Feedback in Human Behavior (30 Dec.)
Arranged by J. Donald Harris.

This symposium of psychologists, speech scientists, and speech pathologists will have the general purpose of bringing together current work and thought on the development and control of human motor response by a variety of sensory feedbacks. The human motor response emphasized often will be speech. The human perception of space will be treated. Sensory feedbacks will be discussed both in the normal condition and subjected to artificial distortions such as time delay, amplitude modulation, etc. Similarities and analogies with physical servomechanisms will be discussed. The development of children's speech through closed and open feedback loops will be traced, and an analysis provided of certain speech and language disorders in terms of feedback circuitry.

Robert Milisen, Courtney Stromsta, Newman Guttman, Robert Milisen, Karl U. Smith, Raymond S. Karlovich.

The Scope and Future Direction of Developmental Psychobiology (30 Dec.)
Arranged by Howard Moltz.

If organisms are to survive, they must be adapted to their environments. Such adaptation is achieved in a variety of ways, the particular mechanisms employed varying widely among the different species. However, in every species and indeed in every individual organism, this process of adjustment and accommodation to the environment involves both biological and behavioral determinants, each interacting with the other in subtle and diverse ways. How these multiform interactions function and come to develop, is the proper subject matter of psychobiology.

As an area of study and research, Psychobiology intersects Biology and Psychology, reflecting interests common to both disciplines. In pursuit of these interests, Psychobiology calls upon the systematist for knowledge of taxonomy and evolution, upon the geneticist for an understanding of inter-organismic and inter-specific variability, and upon the endocrinologist for information concerning the role of hormonal mechanisms in species reproduction and maternal care. To the same degree, it must call also upon the neuropsychologist, the neurophysiologist, and the neuropharmacologist, for essential to the process of behavioral adaptation are neuronal and biochemical mechanisms operating at different levels of complexity. Psychobiology has roots extending into different disciplines. It has the singular task of attempting to understand how biological and psychological events coact to enable species to develop and reproduce, each in its own environment.

Peter Marler, Leonard Rosenblum, Donald Pfaff, Ethel Tobach, Gilbert Meier.

SOCIAL AND ECONOMIC SCIENCES (K)

Comparative Sociology and Contemporary Social Issues (28–30 Dec.)
Arranged by Reuben Hill.

This symposium offers to its interdisciplinary audience both a view of sociologists at work appraising the issue of theory in comparative sociology and the adequacy of its central method of cross-cultural comparisons and the application of this method to three of the most critical of contemporary social issues; civil unrest, persisting poverty, and the rejection of achievement values. The presentations and discussions for each session are designed to carry the perspective on the issue in question beyond the American scene to assess its incidence in other societies and to search for explanations which hold up cross-nationally.

Guy E. Swanson, Allen Grimshaw, Frederick Waisanen, Charles Kadushin, John P. Clark, Richard Flacks, Eugen Lupri, James C. Kimberly, Alex Inkeles, Paul Hollander, Leonard Broom, Robert F. Winch, Bernard Rosen, Wayne H. Holtzman, Murray A. Straus.

Science and Public Policy Workshop (30 Dec.)
Arranged by Eugene B. Skolnikoff.

This workshop will be concerned with the development of academic programs that focus on science and public policy studies. A brief report on the creation of an organizational affiliation for academic activities in this area will be presented. The substantive discussion will center on the roles of social and natural scientists in academic science and public policy studies, and on the problems involved in genuine research and teaching collaboration.

Criminology and Corrections and Research Papers in Juvenile Delinquency (28 Dec.)
Arranged by Donal E. J. MacNamara.

The American Society of Criminology, meeting jointly with the American Association for the Advancement of Science and with its social and behavioral science colleagues among the membership of the affiliated societies, will address itself to two major areas within its discipline. The morning session under the chairmanship of sociologist Edward Sagarin of the City University of New York, will discuss research papers on such themes as the conduct and success of jail inmates released to work within the open community, certain problems relating to the discipline and morale of uniformed correction officers, and *ultra vires* attitudes and conduct of uniformed police officers and its impact on the police-public relationship. The afternoon session under the chairmanship of psychologist, Louis Berkowitz of the Educational Alliance, will concern itself with juvenile delinquency, economic factors in delinquency vulnerables, medical services in juvenile detention facilities, and problems in juvenile court administration and operations. The American Society of Criminology emphasizes the multidisciplinary (eclectic) approach to the problems of crime, delinquency, and related phenomena and encourages the widest latitude in both its formal presentations and the ensuing discussion periods.

Edward Sagarin, T. C. Esselstyn, Alvin Rudoff, George

K. Williams, George L. Kirkham, F. William Howton, Roger Baldwin, Samuel Kramer, Louis Berkowitz, Jack Chwast, Michael Fooner, Albert Hess, Walter A. Lunden.

Values and Metaphysics in Science (30 Dec.)

Arranged by Morton King.

Values and metaphysical assumptions are present, explicitly and implicitly, in the conduct and reporting of scientific research. Some presuppositions must be accepted and used for work to be "scientific"—rather than "theological," for example. Other presuppositions found in the work of scientists are not necessary; they may either aid or handicap scientific work, depending on the presupposition and the problem being studied. Both the scientific community generally and the individual scientist need to be conscious of values and metaphysical assumptions. They should also be consciously critical of the consequences of each such belief. Scholars in the physical and social sciences and in religion will attempt to isolate such beliefs and discuss some of their consequences.

George W. Crawford, Robert W. Friedrichs, Ralph W. Burhoe, Frederick J. Streng, Samuel Z. Klausner, Frederick S. Carney, John A. Maguire, Paul D. Minton.

Measuring Individual Differences in Religion (30 Dec.)

Arranged by Richard L. Gorsuch.

Progress in the study of man depends in large part upon the development of adequate research techniques, including precise instruments for measurement. While the definition and measurement of many variables—such as the rate of learning or social status—are relatively self-evident, the identification and quantification of forms of "religiosity" are more difficult. Part of the problem comes from wide variations in definitions of religion, part from discrepancies within the person between, for example, what he says and what he does, part from contaminating interactions between the person being measured and the measuring instrument, and part from the theological presuppositions of the investigator.

With increasing numbers of social scientists becoming involved in the scientific study of religion, the number of procedures used to identify the religiously committed person has steadily increased. Although some investigators have used arbitrary and naive measuring techniques, others have sought to refine the measuring instruments themselves. These latter attempts have pointed to the problems in the area and are beginning to present solutions as well. The papers in the session on "Measuring Individual Differences in Religion" are designed to acquaint the audience with some of these problems and some proposed solutions.

Morton King, Bernard Spilka, John R. Tisdale, Sam C. Webb, Gustave A. Ferré, Richard A. Hunt, William J. Millard, Jr.

HISTORY AND PHILOSOPHY OF SCIENCE

Vice Presidential Address and Energy and Society (28 Dec.)

Arranged by R. Bruce Lindsay and Melvin Kranzberg.

The concept of energy is the most important in the whole of science and its impact on society continues to grow steadily from both ideological and technological standpoints. The symposium has two purposes. The first is to trace the historical development of the concept of energy and its scientific significance from its origin in antiquity to the twentieth century. The second is to explore the changes which have taken place in the technological uses of energy from the eighteenth century to the present and to provide a projection of such uses to the end of the twentieth century.

Raymond J. Seeger, Edward D. Daub, Erwin N. Hiebert, Martin J. Klein, Eugene S. Ferguson, Harold I. Sharlin, Lynwood S. Bryant, Richard G. Hewlett, and Bruce C. Netschert.

New Directions in 17th Century Research (28 Dec.)

Arranged by Allen G. Debus.

The papers examine aspects of the scientific revolution that have not been widely explored, including the role of the occult sciences in that period. They try to assess the relationship between these aspects and the scientific revolution as a whole.

Nell Eurich, Edward J. Collins, Audrey Davis, and Gerald J. Gruman.

Science and Society in 19th Century Britain (29 Dec.)

Arranged by George Basalla.

The session examines the general question of the interrelations of science and society in a historical setting, and specifically looks at two aspects of that relation in connection with science in nineteenth-century Britain.

Harold Sharlin, Rom Sviedrys, Arnold Thackray and Thomas De Gregori.

Genetics in the Late Nineteenth and Early Twentieth Centuries (29 Dec.)

Arranged by Frederick L. Holmes.

The session will examine the early development of the science of genetics, focusing both on theories of inheritance before Mendel and on some early Mendelians.

Frederick B. Churchill, Garland Allen, and Elof Axel Carlson.

Industrial Archeology (27 Dec.)

Arranged by James C. Hippen.

The results of recent researches in various fields of industrial archeology.

Barnes Riznik, B. H. Rucker, and Richard L. Deily.

Technology and Values (29 Dec.)

Arranged by Emmanuel G. Mesthene.

The effect of technological change on the processes of value formation and value change in the individual and in society; an exploration of the actual ways by which technology affects values; the implications for values of the growing social importance of knowledge and of knowledge institutions.

The relationship between technology and value change as mediated by the religious belief system; the impact of technological change on the structure of myths and meaning systems and the consequences for contemporary religions and values.

The relationship between technology and value change as mediated by the economy; the mechanisms by which technological change produces economic change and the social and value consequences of the emergent post-industrial economy.

The relationship between technology and value change, both direct and as mediated by social change. The value implications of technologically induced social change in present-day society.

Harvey Cox, Nathan Rosenberg, Irene Taviss, Bernard Barber, and Melvin Kranzberg.

Technology as a Social Process in Africa (29 Dec.)
Arranged by Thomas R. Degregori.

A discussion of various technological elements and their sociocultural relationships, with special emphasis on Africa.

Robert C. Davis, Thomas Glick, Klaus Wachsmann, Daniel F. McCall, Oriol Pi-Sunyer, and Robert F. Gray.

Metalanguage Dialogues and Metaphorical Synthesis in Education (26 Dec.)
Arranged by Edgar Taschdjian.

Although much has been done during the last three decades to improve the hardware, software, and methods of education within the age-old structure of knowledge, the real need of the day is to restructure knowledge itself so as to be able to teach several skills, concepts, and processes simultaneously, more effectively, quickly, and economically than any one of them alone. The purpose of this session is to explore some of the possibilities for utilizing the concepts, tools, and models of the general systems analyst in restructuring both knowledge and curriculum patterns.

Felix Kopstein, T. C. Helvey, Jere W. Clark, Henry Moss, and Frederic N. Firestone.

Social Systems in the General Systems Spectrum (28 Dec.)
Arranged by Bertram M. Gross.

The papers in this panel will attempt an initial topological exploration of the many varieties of social systems. Major attention will be given to the different kinds of social systems, as well as to the non-human (or physical) parameters of social systems and the differences between social systems, other living systems, and non-life systems.

Eric Trist, Morton Kaplan, Richard Merritt, Janos Schossberger, Michael Marien, and F. Kenneth Berrian.

Systems Research in Organization and Management (29 Dec.)
Arranged by Lawrence L. Schkade.

Systems research in organization and management will be considered through the presentation of a cross section of topics from this general area of research, accompanied by a discussion of topics of interest to the group. Short presentations will include (1) a comparative study of belief systems regarding work in social systems ranging from morphostatic to morphogenic; (2) the application of relativity to cybernetics utilizing the ecolithic approach to systems design, with implications of organization and management; (3) communicating to managers the concept of a business organization as a system model; and (4) measurement of input, maintenance-processor, and output variables and identification of relationships between variables in an organizational system. The general discussion may be extended to include topics of general interest such as systems approach to problem identification and definition, organization communication systems, management information systems, systems models of the firm, and models of human organizational behavior.

R. Oliver Gibson, Frank Baker, Daniel M. Duncan, Ralph M. Stodgill, and Yehezkel Dror.

Conflict Resolution and Arms Control (30 Dec.)
Arranged by L. B. Slobodkin.

Conflict Resolution is becoming a major social science discipline with obvious practical significance and, perhaps less obviously, new models of problem solution and thought. The intellectual framework is derived from biological, economic, and sociological as well as physical models, so has clear ties to the general systems point of view. The omnipresence of contemporary conflict makes presentation of the intellectual basis of conflict resolution absolutely vital.

Richard H. Cady, Martin Shubik, and Stuart Altman.

The Analysis and Evaluation of a Scientific Field (30 Dec.)
Arranged by Stuart Wright.

The symposium has two parallel purposes: (1) to analyze the results of current systems studies of the analysis and evaluation of research activities, and (2) to review the methodological problems of this area, together with their solution status. Topics include: objective methods for the systemic modeling of a scientific field; use of cluster analysis for identifying trends, and for orienting projects in hyperspace; development and application of criteria of scientific and mission systems for planning purposes. The symposium will attempt to articulate the values of a systems approach to the topics discussed, and to the overall problem of planning an effective, long-range research support program by a government agency as the nation enters an era of reduced funding.

Charles W. Williams, Jr., Charles A. Baker, Carol Steinhart, and John Rowen.

ENGINEERING (M)

For details, see page 1157.

MEDICAL SCIENCES (N)

The Control of Fertility (27 Dec.)
Arranged by Hudson Hoagland.

In the morning session the symposium will deal with the

magnitude and threat of rapid population growth and comparisons will be made between population control in animal and human societies. The physiology of eggs and sperm and endocrine factors regulating fertility will be reviewed in some detail.

The afternoon session will deal with recent advances in processes of human fertility control and with social and cultural factors involved in the acceptance or rejection of family planning procedures.

The material presented should have considerable general interest to sociologists, biologists, and laymen.

Shields Warren, Min Chueh, Michael J. K. Harper, Roy O. Greep, Sheldon Segal, and Margaret Mead.

Molecular Approaches to the Central Nervous System (29–31 Dec.)

Arranged by William L. Byrne.

The three programs in this symposium represent selected areas which hold promise for a further understanding of the central nervous system at the molecular level. The program on development of the nervous system and mental retardation will include an interdisciplinary presentation of human biology which once again represents an opportunity to demonstrate that human disease is a fertile area for scientific discovery as well as an area in which there is great need for prevention and treatment.

Ejnar J. Fjerdingstad, Georges Ungar, Robert E. Cooke, Marcus Jacobson, Philip Dodge, Donald Cheek, William L. Nyhan, J. Edwin Seegmiller, Roscoe D. Brady, Guy M. McKhann, Andrew E. Lorincz, George Smith, R. Rooney Howell, Henry P. Mahler, John Gaito, Edward Glassman, Bernard Agranoff, Peter Carlton, and Samuel Bogoch.

Some Concepts and Trends in Clinical Bioanalysis (28 Dec.)

Arranged by Morton D. Prager.

The symposium will have the general purpose of providing discussion of several fields which are the subject of active research investigation and which have important implications for the clinical laboratory. The four areas which have been selected for presentation include (1) methods for analyzing complex mixtures of lipids, (2) developments in the analysis of hormones, (3) the biochemistry of blood coagulation, and (4) methods for separating and characterizing the immunoglobulins. The discussions will entail a broad overview of each field with implications for the clinical laboratory, as well as presentation of the newer methodology.

Ezio A. Moscatelli, Pentti K. Suteri, Robert J. Speer, and Joseph Lospalluto.

Pathways to Careers in the Health Profession (28 Dec.)

Arranged by Virgil Tweedie.

The material to be presented and discussed should have wide interdisciplinary interest for those educators and advisers concerned with the preparation of students in the undergraduate college for careers in the health professions. All persons interested in premedical and predental education and concerned with the advisory and guidance program for such students are invited to attend.

Norman F. Witt, Charles C. Sprague, Kenneth V. Randolph, Robert K. Bing, James L. Dennis, and James R. Schofield.

DENTISTRY (Nd)

Mucous Membranes and Their Secretions (27–28 Dec.)

Arranged by Barnet M. Levy.

The purpose of the symposium is to bring together investigators with a major interest in the broad topic of mucous membranes. The symposium was designed to lead to a discussion of the recent advances in the knowledge of mucous membranes and their secretions. The program begins with broad coverage of the morphology, physiology, pharmacology, and chemistry of mucous membranes. It then focuses on the oral and nasal mucosa, culminating in the clinical applications of the basic knowledge of mucous membrane phenomena. The program is interdisciplinary in scope and should be attractive to both clinicians and basic scientists.

Eugene Zimmermann, Robert Liebelt, Dewey F. Sears, Don M. Carlson, Kenneth V. Randolph, Irwin Mandel, Bernard Tandler, James Klinkhamer, Burton Shapiro, Roger Rossen, William T. Butler, R. J. Genco, Jack Bishop, Leon Schneyer, Stanley J. Gerson, Julia Meyer, E. J. Wheeler, John K. Hampton, Jr., Samuel Dreizen, George Wolf, Harold H. Varon, Edward P. Allen, and Robert Gorlin.

AGRICULTURE (O)

Research for the World Food Crisis (27–28 Dec.)

Arranged by Daniel G. Aldrich, Jr.

Some investigators are projecting world food shortage and over-population factors which indicate disastrous conditions of famine and social and political upheaval, if present trends continue. The Section O, Agriculture, symposium will have the general purpose of providing an overview of the problem on a world scale and of presenting reports of progress of research and technology on food supply and population control in India, South Asia, Africa, Latin America, Europe, and the United States. The area reports, among other things, will consider food production research and technology, food processing research and technology, new sources and improved quality of foods, the logistics of technology, population control, and the impact of research and technology on the welfare and economy of the area. Reports of specific research will be presented on animal production and nutrition, environment control, growth regulation, mechanization, nitrogen fixation, nuclear power in agro-industrial development, plant management, soil management, and water management.

Will M. Myers, A. H. Bunting, Robert Best, Nyle C. Brady, D. L. Umali, Jose Marull, Sylvan H. Wittwer, John C. Calhoun, Jr., James H. Meyer, Louis T. Kardos, Lawrence Rappaport, Roy Bainer, Constant C. Delwiche, T. C. Byerly, R. Philip Hammond, Richard Bradfield, Nyle C. Brady, and Robert M. Hagan.

Problems in Feeding the Hungry (29 Dec.)
Arranged by Helen R. Skeggs.

The nature of the problems encountered in combating malnutrition at home and abroad will be discussed. While the problem is most critical in developing countries there is increasing evidence that pockets of malnutrition exist in more prosperous economies. The most vulnerable member of the community is the pre-school child whose early deficiencies may prevent full achievement of his potential. There is laboratory evidence to indicate that the maternal diet may influence child development. Providing necessary supplements in an acceptable form is but one facet of the problem. Malnutrition cannot be isolated from the ecology of the community.

Virginia M. Vivian, Bacon F. Chow, Ercel Eppright, Catharine Rose, and Arnold E. Schaefer.

INDUSTRIAL SCIENCE (P)

Continuing Education for Engineers—Policy and Operating Issues (28 Dec.)
Arranged by Zola Bronson.

The general purpose of this symposium is to identify, discuss, and reconcile the views of management, practicing engineers, and educators regarding their respective responsibilities for helping offset and overcome the technical obsolescence of the engineer; and to evaluate management's Continuing Education policies and practices vis-à-vis the engineers' expressed needs and appraisals of existing resources and opportunities for technical refreshing and updating. Both management and the engineer will respond to academia's views of its role and service responsibilities in Continuing Education. The importance of employee motivation for self-renewal and the effects of organization spirit on engineer responsiveness will be among the topics discussed. Basically, the operational and personal problems that affect Continuing Education resource utilization will be emphasized. Specific programs, education modes, and instructional mechanisms will be considered only peripherally. The overall objective is to develop an integrated understanding of organizational and individual Continuing Education needs, responsibilities, and problems in order to improve technical manpower utilization.

Richard Renck, Paul E. Purser, Albert V. Willett, Jr., Sheldon Davis, George J. Maslach, Israel Katz, James D. Boulgarides, and Edward H. Freiburghouse.

Current State of Research Management (30 Dec.)
Arranged by Gordon K. Teal.

The management of research as carried out in industry varies greatly from company to company. The approach is strikingly influenced by the nature of products or services produced, by the technology currently used, by international operations, and by other aspects of the business. The speakers will discuss research management in their particular companies, describing their business, the manpower resources, the organizational structure of the company, and the particular methods used in planning and initiating research and in carrying it over into the development of products and services. They will discuss modes of research interaction between different parts of their companies that contribute to staying ahead of competition and maintaining an acceptable profit.

Dayton H. Clewell, Winston E. Kock, and Jerrier A. Haddad.

The Current State and Outlook for Research-on-Research (30 Dec.)
Arranged by D. W. Collier.

The session will have as its general purpose to bring the nonspecialist up to date on what is being done and the outlook for improving the research process and its management by means of research in the social sciences. Some of the pressing problems working research managers identify as needing research will be outlined. Then a review of current projects under way in this field will be given. A behavioral scientist will give his viewpoint on some approaches to improving the research environment. And finally, a representative of federal government science will express his viewpoint on what is and what needs to be done to further improve the field.

Merritt W. Williamson, Albert Rubenstein, Herbert Shepard, and Zola Bronson.

EDUCATION (Q)

Education and Societies in Transition (27 Dec.)
Arranged by Willard J. Jacobson.

Societies throughout the world, including the United States, are undergoing radical changes. Many of these changes are due to developments in science and technology. For example, the application of the gas laws in the internal combustion engine and the use of the internal combustion engine in the mechanization of agriculture has been a major factor in the mass migration from rural areas into urban centers. The nature of some of these changes will be explored with their implications for society and education. Possible roles for education in societies in transition will be discussed.

Myron Atkin, Sloan R. Wayland, John Renner, and Willard J. Jacobson.

New Developments in Educational Technology (27–28 Dec.)
Arranged by Harvey J. Brudner.

This program has been structured to review three of the most important new developmental areas in education; namely, the use of computers as a direct aid to the instructional process, the use of communication systems and new audiovisual developments, and new comprehensive systems for individualized instruction.

Three major panels have been assembled involving both proponents and critics of some of the elements in these new approaches. A lively interchange between these groups will then be expanded to include opinion and reaction from the symposium attendees. Workshop sessions in each of the three areas will be held Friday afternoon in order to allow for further participation by the registrants.

Ed Adams, Robert J. Seidel, M. Keith Myers, Hugh

McDougall, Charles Blaschke, Ben Edelman, Richard C. Gearhart, Walter LeBaron, John W. Wentworth, Fred M. Heddinger, Frank J. Blaisdell, Donald T. Tosti, Howard B. Hitchens, Jr., Willard J. Jacobson, John Flanagan, Karel Montor, Joseph Lipson, Edward Maltzman, J. Myron Atkin, and Marvin W. Kirkman.

Education as It Relates to Technical Education (29 Dec.)

Arranged by Jerry S. Dobrovolny.

The shortage of competently trained para-professional employees in all of the professional fields has brought into sharp focus the need for the establishment of a large number of post-high school educational programs designed to prepare technicians. Education beyond the high school is today a recognized social and economic necessity. The concept of technical education as being a part of higher education has emerged during the past decade as the job functions of the technician have been delineated to require a significant mathematics and science base.

Many problems remain to be resolved from the standpoint of curriculum content, manpower needs, semantic differentials, teacher preparation, student identification and motivations, and the public image of technical education. Several professional organizations have been actively involved in working on some of these problems. Included among these are the American Technical Education Association, American Association of Junior Colleges, American Society for Engineering Education, and more recently the Commission on Science Education of the American Association for the Advancement of Science.

The purpose of the symposium is to bring to the attention of the scientist, the industrialist, and the science educator some of the critical problems facing the implementation of program offerings for technicians. Since these programs are post-high school and are considered a part of higher education, the role of the junior college and the comprehensive community college must be considered as having the greatest potential for providing the vehicle for program implementation. There is a need for the science educator to understand the succinct differences between technical education and trade preparatory training on the one hand, and preprofessional science and mathematics education at the lower division on the other hand. He must also recognize his responsibility in becoming involved in the development of new approaches in science education to help solve some of the problems associated with science educators in technical education programs.

Lewis R. Fibel, Stanley M. Brodsky, Maurice W. Roney, Arnold A. Strassenburg, Roy Dugger, George H. Linnaberry, Joseph A. Patterson, and Harold S. Kelly.

Individually Prescribed Instruction (28 Dec.)

Arranged by David R. Krathwohl.

The purpose of this session is to introduce people to the Learning Research and Development Center's Individually Prescribed Instruction Project at the University of Pittsburgh. The major assumption underlying this Project is that the individualization of instruction implies providing an individualized program of studies for each student based upon his needs as a learner. As presently operating, the Project has been developed for the selected areas in the elementary school program of mathematics, reading, and science. The model has the following components: (1) sequentially established curricular objectives in each of the subject areas; (2) instruments for the diagnosis of student achievement; (3) materials for individualizing instruction; (4) the system for individually prescribing the learning tasks; (5) strategies for information feedback; (6) the reorganization of the total school setting. In addition to the general description of the Project, the general plans for evaluation both summative and formative, plus examples of the evaluation to date, will be presented.

John O. Bolvin, Richard C. Cox, and C. Mauritz Lindvall.

Science, Education, and Society (27–29 Dec.)

Arranged by Ruth Scott.

Unified Knowledge of Man and Environment:

Unified knowledge of man and environment based on pure ecology must be an educational goal in this generation. The emphasis is on the urgency to think in terms of ecosystems. Is nature more complex than we can think? Conservation education has failed. The speakers will present new approaches to conservation and environmental education designed to develop a biocentric concept.

William B. Stapp, Albert H. H. Dorsey, Carolyn A. Gibson, Joseph I. Lipson, and Ben D. Mahaffey.

The System, Socio-Economic-Political, and Ecosystems:

The threat to survival and our Democracy grows dangerously. Ecological failure permits the "technostructure" to determine values and changes in the environment without adequate controls. We know the misapplications of hasty technology must end. How?

Howard E. Weaver, Joe Berwick, Donald J. Zinn, W. Frank Blair, and George M. Woodwell.

Tailoring Outdoor Programs to Community Needs:

Introductory statements will be made by the session chairman regarding the major sources of support for outdoor education programs throughout the nation; general goals and objectives of these programs will be briefly examined.

Each participant will develop a 25-minute presentation with 15 minutes following set aside for questions. Slides will be used in the presentations. The programs will be described by the presentors according to a general format: design and purpose of each school program; how tailored to community needs, how conceived, program objectives, population served; scope of program, time of year, day student or resident, number served, staff services, facilities used, length of time in operation, experiences of children; provisions for teacher preparation; reception by the community, parents, teachers, and children; evaluation of the program, how the evaluation is conducted, what instruments if any are used in evaluation, evidence of behavioral changes in children; and the major limitations that the program currently faces.

A reaction to all the presentations will be developed from the perspective of Morris Wiener whose professional preparation is in the areas of curriculum development and outdoor education.

Robert Vogl, John Cox, Fred L. Betz, David W. Faith, Morris Wiener, C. E. Emanuelson, and Edward J. Ambry.

Issues in College Biology Teaching (28–29 Dec.)
Arranged by Edward J. Kormondy.

Teaching-Research: Does Research Have a Beneficial Effect on Teaching?

An examination of the role of a college biology instructor's research in improving his teaching abilities. Results of a survey of many biologists in small and large institutions will be discussed; negative and positive aspects of the central thesis will be explored by individuals holding definite viewpoints. The feasibility and desirability of developing testable hypotheses and of revolving this controversy will be proposed.

Dana L. Abell, Jeffrey J. W. Baker, Willis Johnson, and Jack Carter.

Biology in the Two-Year College:

The perplexing and vexing problems of instruction in biology in the two-year college will be the focus of discussion. Perspectives will be afforded from persons intimately involved in the two-year college with added insights from one concerned with the problem from a different vantage point.

The panels, representing experiences in a wide variety of two-year colleges, will provide a realistic basis for discussing the subject—one of immediate concern in view of the substantial and increasing number of students attending two-year colleges.

Edward J. Kormondy, Richard A. Dodge, Martin W. Schein, Martin Brown, Jane Griffith, Mary Ann McLanathan, Adrain Poitras.

The Flight from Science (29 Dec.)
Arranged by A. A. Strassenburg and Robert Silber.

The Cooperative Committee on the Teaching of Science and Mathematics is concerned about the decreasing interest in and prestige of science in our present-day society. The committee members feel that there should be general discussions on the magnitude of the problem, causes, and possible solutions. While decreasing enrollments in programs which prepare scientists is one disturbing manifestation of the problem, the committee believes that the alienation of nonscientists from science is, in the long run, a more serious threat to the vigor of the scientific enterprise.

The program has three parts. The first talk will attempt to document that a flight from science is taking place, and will present facts and statistics indicating the magnitude of the effect. There will follow a panel discussion involving four individuals who will present ideas on why special categories of individuals—nonscience students, women, and adults—avoid contact with science.

The session will close with a talk which will present suggestions on how the gap between the two cultures can be narrowed and a review of the national resources which can be used to insure our continued leadership in scientific research.

Edwin Kurtz, Kathy Swartz, Elizabeth D. Hay, Athelstan Spilhaus, and Marvin Feldman.

Developing Scientific Literacy in College Science Courses (28 Dec.)
Arranged by Albert F. Eiss.

Speakers at this session will review work that has been done during the past two years related to defining and improving scientific literacy. They will recommend specific changes in college science courses in both the content and the instructional techniques that might be helpful in improving science courses with specific emphasis on general education science.

Lloyd M. Bennett, John E. Butler, Jay Barton II, R. Will Burnett, Pauline Gratz, and Katherine M. Jones.

A Systems Approach to Science Education (29 Dec.)
Arranged by Albert F. Eiss.

Speakers will discuss the significance of a systems approach to educational problems. An analysis of the nature of an educational system as it applies to the instructional program will provide the basis for specific suggestions on ways that it may be implemented in secondary schools, and the possible impact this approach may have on college science instruction.

Glenn H. Crumb, Adrian N. Gentry, Robert R. Bryden, Addison E. Lee, and Otis O. Lawrence.

The Role of Science Education in an Urban Environment (29 Dec.)
Arranged by Paul J. Cowan.

Speakers will explore the role that science education can play in the education of urban children, giving particular emphasis to its potential for providing the motivation for improved written and oral communication, its value in stimulating a desire to read, and its value in adult living.

Ernest F. Powers, N. Eldred Bingham, Carl Beisecker, Helen C. Conlon, and Samuel Schenberg.

INFORMATION & COMMUNICATION (T)

Science and the Television Media (28 Dec.)
Arranged by David Prowitt.
Speakers to be announced.

Science-Knowledge Communications Interfaces (30 Dec.)
Arranged by Dale Baker.

J. C. R. Licklider, Theodore C. Hines, Horace Tompkins, and Robert McRorie.

Technical Publications—Job Patterns and Qualifications (27 Dec.)
Arranged by Ethaline Cortelyou.

Howard D. Cole, W. A. Hogan, John A. Walker, and Samuel Kennedy.

STATISTICS (U)

New Methodology in Classification (28 Dec.)
Arranged by Rosedith Sitgreaves.

Robert Sokal, Eugene Garfield, Morton Malin, F. James Rohlf, Herdman Friedman, and Jerrold Rubin.

Empirical Sampling Studies (28 Dec.)
Arranged by M. Bryan Danford.

Rosedith Sitgreaves, M. Bryan Danford, Phelps P. Crump, and Harry M. Hughes.

Biological Rhythms (30 Dec.)
Arranged by Rosedith Sitgreaves.

H. Lipscomb, Franz Halberg, Arne Sollberger, Donald L. Holmquest, and Donnalie O. Campbell.

Radioimmuno Assay (30 Dec.)
Arranged by Rosedith Sitgreaves.

Chester I. Bliss, Waldemar Storvick, Curtis Meinert, D. Rodbard, P. Rayford, and G. T. Ross.

Implications of Educational Statistics in Formulation of Federal Policy (30 Dec.)
Arranged by Dorothy M. Gilford.

The purpose of the session is to discuss the value of existing educational statistics in planning, decision making and control, and to stimulate discussion on needs for additional educational statistics for use in research and administration. The papers will cover topics such as trends in graduate school enrollment, federal support to higher education, and the need for social indicators in education.

Thomas Mills, Theodore Drews, Joseph Froomkin, Charles Falk, John Brandl, and Charles Kidd.

Statistical Organization and Social Problems (27 Dec.)
Arranged by Ezra Glaser and David Rosenblatt.

The symposium will explore several aspects of a possible organization of a national statistical system: the important uses, the issue of the invasion of personal privacy, the strategy and principles of systems design, the impact of computer technology, and the issues of organization and authority. The principal focus will be on the role of the federal government. The unique contribution of the symposium will be the specific recognition that the five topics cannot profitably be discussed in isolation (as they have been on several occasions). The first two items will set forth the partly countervailing social needs for (1) information for the development, review, and appraisal of programs dealing with significant social problems, and (2) protection of individuals against unwarranted invasion of their privacy. The problem is to design an information system that strikes an acceptable compromise. The next two items set forth the potential contributions of the statistical profession and computer scientists to this problem. The final item is addressed to the problems of providing the authorities and organizations necessary to the initiation, operation, and growth of the proposed statistical system. The emphasis will be on the interaction of these five topics.

Norman H. Jones, Jr., Anthony Mondello, Edward C. Bryant, Morris H. Hansen, Harry Markowitz, and Paul F. Krueger.

Random Counts in Scientific Work (27–29 Dec.)
Arranged by G. P. Patil.

Endowed with a wide and rapidly expanding literature, both in diverse fields of applied science and statistics the subject of random counts in scientific work or discrete distributions and their applications offers a fascinating area of study and research. While it is conceivable that not very new and novel theories of statistical inference may be specially needed or used to analyze the data on random counts, it is evident that there is great scope in the nature of new and novel mathematical and statistical approaches and procedures pertaining to special types of counted data related to individual scientific problems. Two aspects may be considered in this connection. One is to investigate in detail and in depth individual discrete distributions for their mathematical and statistical properties and for their natural applications. The second aspect is to concentrate on a scientific problem generating or requiring counted data and to create and coordinate appropriate discrete models and methods to be able to arrive at a meaningful solution of the scientific problem. Thus, the present analysis shows that there is much to offer here for the advancement of the basic and applied sciences and also for the advancement of statistics. Through the subject of discrete distributions, the analysis also provides an example where the sciences and the statistics can help each other advance. A major purpose of the present symposium is to render service to such a cause.

Frederic M. Lord, William J. McGill, V. R. R. Uppuluri, William L. Harkness, Paul W. Holland, S. Fienberg, John E. Walsh, C. I. Bliss, Joel E. Cohen, L. R. Shenton, P. Skees, K. O. Bowman, Herman Rubin, James E. Mosimann, S. K. Katti, John J. Gart, L. R. Shenton, Michael F. Dacy, J. C. Griffiths, D. A. Sprott, S. W. Joshi, S. J. Press, and C. Chatfield.

GENERAL SCIENCES (X)

Budgetary Problems of Academies (27 Dec.)
Arranged by V. Elving Anderson.

Harry J. Bennett and G. Gerald Acker.

Collegiate Academies of Science (27 Dec.)
Arranged by V. Elving Anderson.

John R. Mayor, C. M. Vaughn, J. M. Armer, and J. T. Self.