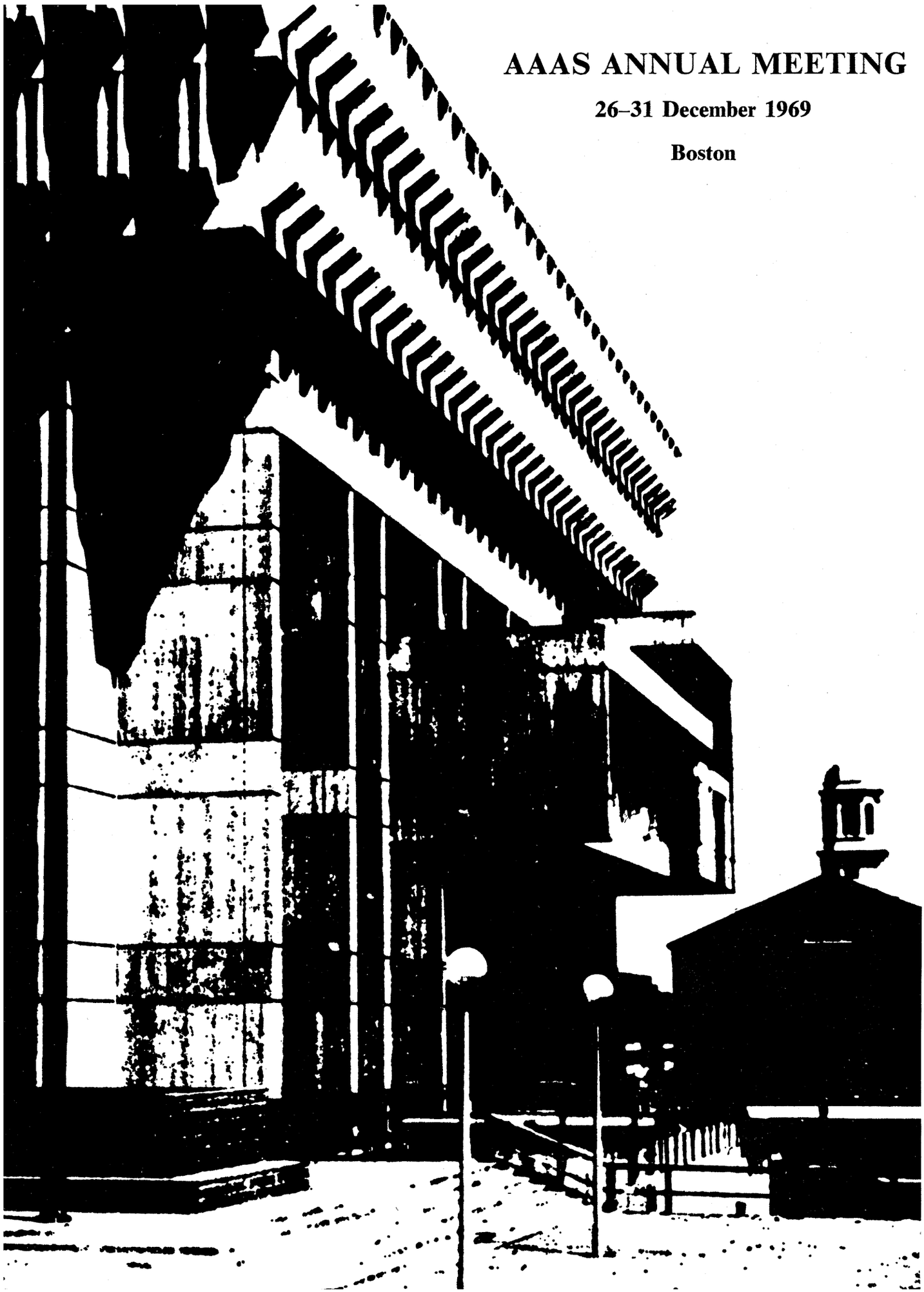
# AAAS ANNUAL MEETING

**26–31 December 1969**

**Boston**



# At the Midpoint of Change

Walter G. Berl, Meeting Editor

Even a cursory inspection of the natural history of scientific meetings shows to what an extraordinary degree they have proliferated in numbers, in character, and in structure. Any "weekly calendar of events" lists them by the hundreds, anywhere in the world, on every conceivable topic, degree of specialization, sophistication, and size. With such a profusion of activity it is fair to ask: "What useful purpose does the AAAS Annual Meeting serve?"

The answer to this question would be "not too much" if the practices of the first half of this century had continued unchanged. Then, the AAAS (as it still is today) was divided into many sections, each with a concern for a particular branch of science. These sections, with the assistance of a varying number of affiliated professional societies, arranged their programs to be primarily of interest to members within their group. While this was clearly a worthy objective at the time, it lost much of its value as professional societies grew in size and in numbers, to the extent that many specialized matters are now best discussed within their areas of jurisdiction. The advantages of meeting jointly under a single AAAS umbrella became less clear, a trend that was abetted by faster and more convenient means of travel and the funds to make use of them. Perceptive observers recognized that the central purpose of the AAAS meetings had to shift. We are in the midst of this metamorphosis.

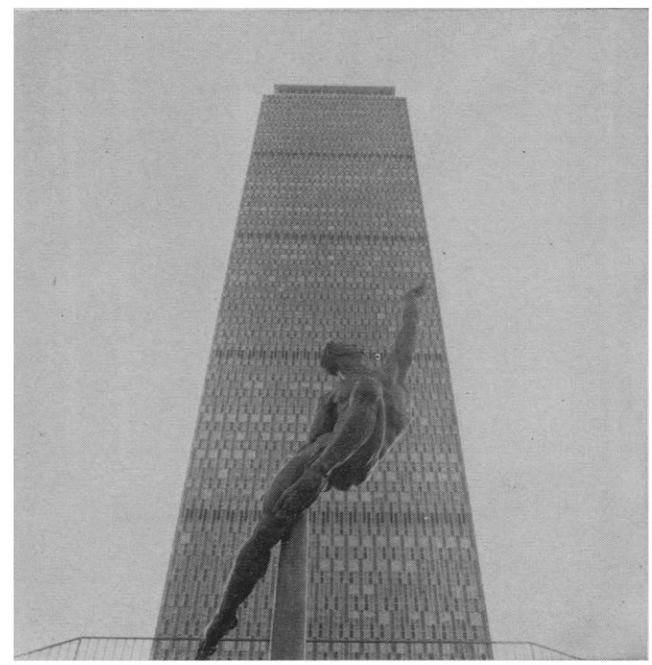
What is this change? An inspection of the program will show that a substantial number of topics are on the agenda that would fit into the conventional sectional categories only with great difficulty. This is particularly true for the AAAS Committee Symposia and for the General Symposia. Even within the sectional programs the loosening and crossing of disciplinary boundaries is evident. This is a healthy sign because topics are now considered for which specialized professional societies either do not as yet exist or they are discussed before special claims are laid to them by others. Bridge-building with wide interconnection of ideas is the core of this endeavor. A report to the country on the state of science is its goal.

Another point of departure is the intent to discuss complex matters in such a way that they become accessible to a wide public, in a language that can be understood by all participants, but without losing precision and style. If a general public is to feel at home, specialized shorthand and obscure expressions are out of place. Successful involvement in this activity requires for its implementation a variety of tools. It makes demands on the host city to be unusually hospitable, on the organizers to be timely in the choice of topics, on the participants to be stimulating, on the audience to be responsive, and on the arrangers to make it all come true.

What are some of the specifics? For the third year, a substantial television effort is underway to present to a wide audience thoughtful persons with new ideas, to let them see what manner of men and women are engaged in the scientific enterprise. Letting them speak for themselves, without too many editorial intrusions, contributes to public understanding of a most direct kind. Through radio, the press and other news media, through the rapid release of audio transcripts, the center of activity of the Meeting is moving beyond the walls of the lecture room. Without essential loss of human scale, the needs of a potentially much larger audience can thus be met.

To a degree not experienced recently at AAAS meetings, the citizens of Boston and its institutions are contributing much of interest. Exhibits, tours, open houses, and receptions are designed to supplement the verbal communications. A fruitful interaction between visitors and residents is in store.

Could all this be done on a substantially smaller scale? There are valid objections to bringing together too many people, too many symposia in parallel, too much material in too short a time. Examination of this predicament is an assignment for the future. However, once it is recognized that some departure from old customs presents rich, new opportunities it will be relatively easy to find fruitful expressions of the basic purpose of the AAAS Annual Meeting.



Prudential Tower [Gary Laurish]

# AAAS INVITED LECTURES, DISCUSSIONS, AND FILM LECTURES

## Special Lecture (26 Dec.)

Speaker: Thomas O. Paine (Administrator, NASA).

*Our Future in Space.*

## Distinguished Lecture (27 Dec.)

Speaker: Emilio Q. Daddario (House of Representatives).

*Freedom of Choice: Political or Scientific?*

The scientific community has had comfortable sledding in the wake of Sputnik for more than a decade. Now, faced with harsher budget realities, mushrooming costs, extensive competition for funds and prospects of technology assessment, some of the community's leading figures are beginning to swing wild. They are displaying, too often, an appalling lack of understanding of the dilemmas of political power.

This paper will delineate the invalidity of some of the positions taken by scientists today. It will show some of the blindnesses of scientists and engineers in the past. It will discuss the great need for order, cooperation, and trust between science and government in the years just ahead—and suggest the likely alternatives if we fail to achieve them.

## Address of the Retiring President (28 Dec.)

Speaker: Walter Orr Roberts (President, University Corporation for Atmospheric Research, Boulder).

*After the Moon, the Earth!*

The moon landing by Armstrong and Aldrin in July, and the safe return of Apollo 11 with lunar rocks for scientific analysis, was one of man's truly great adventures. The moon-circling flight of Apollo 8 just a year ago, and the successful transfer by two Soviet cosmonauts from Soyuz 4 to Soyuz 5 further demonstrate how far we of the earth have come in the conquest of space.

We now have opportunity to take an equally bold step in another direction in space. We can now exploit our new found space skills for the benefit of earth and its peoples. And we can do this cooperatively, as a joint venture of men of one world improving the common habitat, the world. It is a venture to kindle the enthusiasm of men of every land. It is a task that has important participating roles for men of every land.

Weather forecasting provides but one example of the earth-oriented use of space science with great potential human benefit. A fiendishly difficult and challenging problem lies before us in this field—to understand the complex forces that drive the global winds and produce the still unpredictable, long-term changes of weather and climate. It will take vast resource commitments. To solve the problem without space satellites of new and highly sophisticated character is unthinkable. Many other developments will also be needed, if the goal is to be attained, and these will require cooperative involvement by scientists and engineers in every part of the world, in the developed and in the developing countries.

Forecasting our environment, moreover, is not enough of a goal. The planet we share is reaching the limits of its ability to survive the environmental insults of man's advancing technology. We are polluting, paving, and poisoning at an ever-increasing rate. A challenge worthy of our greatest skills and our highest moral commitment stands before us as the next step in space. After the moon, let us turn our best talents to the earth.

## The Scientific Research Society of America (RESA) Annual Address and Panel Discussion (29 Dec.)

Speaker: Margaret Mead (American Museum of Natural History).

*The Changing Significance of Food.*

We are faced with the problem of relating plenty in favored parts of the world with increasing scarcity and famine in many other parts of the world. Although peoples have frequently faced the contrast between plenty at home and scarcity abroad, and between well-fed and starving sectors of the population at home, the capacity of one people to help another has been limited to acts of organized charity, massive temporary responses to conspicuous famine conditions, and—during the last half century—various sorts of technical assistance. The ethical problems involved in the relationships between the malnourished, the starving, and the well nourished became more complicated as the capacities to meet these problems grew, and as our realization of the role of food, not only in sustaining life and for maintaining the core of human relationships in family and community, but differentially in the relationships of specific diets to prenatal care, early childhood development and the control of disease, and our productive capacities expanded. The contrasts between a partially regulated affluence which led to new forms of waste and overeating—and to that appallingly anomalous condition of "overnutrition"—and our increased ability to produce ourselves, combined with a greater and more intimate knowledge of conditions of the undernourished and starving in the world, has produced

a state of callousness and inattention which has infected our own affluent society, and resulted in starvation and hunger in the midst of plenty. Meanwhile our failure to deal with major ecological problems means we are exporting exploitive methods of agriculture abroad. The world has become a single unit, mankind cannot live half starving and half overfed.

Panel Members: *Robert Choate, Norman W. Desrosier, Jean Mayer, and Effie Ellis.*

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

Speaker: Kingman Brewster (President, Yale University).

*If Not Reason, What?*

### British Association for the Advancement of Science Lecture (30 Dec.)

Speaker: Sir Alexander Cairncross (President-elect, British Association for the Advancement of Science).

*Controlling the Economy—What Does It Take?*

Industrial economists have set themselves a number of economic objectives (such as full employment and faster growth) that were not explicitly recognized before the War as a responsibility of Government. These objectives are not always precise or, if precise, compatible with one another; and there is much more emphasis on the goals of policy than on the instruments for attaining them. One such goal is economic stability, which it is now generally agreed can be promoted without comprehensive planning and control of the economy provided action is taken to stabilize effective demand. But what action is best calculated to achieve this result? Should governments rely primarily on varying taxes or operate mainly on their own outlays? Should they concentrate on stabilizing investment or consumption? How promptly and frequently should they intervene? Can they make diagnoses and forecasts of the economic situation sufficiently accurately to prevent perverse interventions? Above all, can public opinion be relied upon to entrust governments with the powers required and to support action that may have unwelcome immediate results?

### Film Lecture I (26 Dec.)

Speaker: Roger T. Peterson (Old Lyme, Connecticut).

*Galápagos—Wild Eden.*

Located off the coast of Ecuador in the Pacific Ocean are the Galápagos, a dozen islands born of volcanic disturbances below the bed of the sea. They have existed for scarcely more than a million years—a short time in the geological sense. Yet here are huge, unique land tortoises with shells 4 feet long, weighing hundreds of pounds, and presumably of great age. Here too are penguins living on the very Equator, pioneers from the colder lands down under, that have ridden the cold Humboldt Current to this tropical outpost. There are little black finches of a dozen species, flightless cormorants, and mockingbirds that are losing the power of flight. Here the cacti have trunks like those of pine trees; the land iguanas resemble miniature dragons, and their smaller relatives are the only seagoing lizards in the world. It was in these enchanted islands that Charles Darwin stumbled onto the clues that led to his theory of evolution.

To some who have visited the Galápagos they are a dreadful place. Herman Melville commented: "In no world but a fallen one could such lands exist." And yet to others, these same scorching cinder-covered islands are a "Garden of Eden."

### Film Lecture II (27 Dec.)

Speaker: Edwin E. Aldrin, Jr. (Astronaut, NASA).

*Apollo and the Future.*

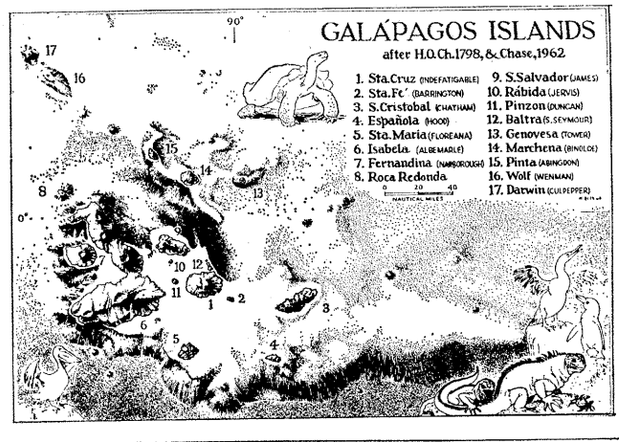
### Film Lecture III (28 Dec.)

Speaker: Eugene M. Shoemaker (Chairman, Department of Geology, California Institute of Technology).

*The Footsteps of John Wesley Powell—A Trail Grown Cold Recovered.*

About 150 camera stations for the photographs taken by E. O. Beaman and J. K. Hillers on the second Powell expedition in 1871 and 1872 were reoccupied and new photographs were taken in 1968. Preliminary comparative study of the old and new photographs shows that most parts of the canyon floors and walls along the Green and Colorado Rivers exhibit very few easily detected changes in the bedrock or the surficial deposits. In most places, small and large boulders along the river banks, and large boulders in the rivers are in the same place and position today as they were on the second Powell expedition. This is true even at large rapids.

Geological changes that were observed include rock falls and headward extension of rock slides on the canyon walls; erosion at river banks and exchange of boulder deposits along river banks, particularly at rapids; local, selective removal of boulders along river banks; deposition of new boulder fans at the mouths of side canyons; and removal of old and deposition of new large boulders



in rapids. In the general case, either part of the foreground scene was changed entirely, or no changes were observed at all. The observations show that most of the geological changes in the Green and Colorado river canyons do not occur by gradual wearing away or deposition of material, but rather by a series of small and large catastrophes.

A film of the 1968 U.S. Geological Survey expedition on the Green and Colorado rivers will be presented with the lecture.

### Film Lecture IV (29 Dec.)

Speaker: Bruno Bettelheim (Rowley Professor of Education, University of Chicago).

*Communal Child Rearing in Israeli Kibbutzim.*

The communistic Israeli kibbutzim offer to the social scientist an "experiment in nature" in regard to personality formation, since their method of child rearing is radically different from any other in Western society. In these agricultural communes, children from birth on are not raised by their parents, but in groups. Within 5 days after birth, they are placed in communal nurseries, later in children's and youth houses, where they are reared by communally appointed educators. While they have contact with their parents, the parents have no control over their life or upbringing, other than that which they exercise as members of the general assembly which decides on all matters pertaining to the community. Under such conditions all those functions which we consider parental are no longer that, but are communal functions.

This experiment of rearing human beings radically differently from our methods is particularly important because these children so brought up later show hardly any of the disabilities from which many among us suffer, such as delinquency, drug addiction, homosexuality, or dropouts. Nearly all of them grow into hardworking, self-respecting, well-satisfied solid citizens of their communities. In any emergency, such as the recent Six Day War, they provide outstanding leadership for the entire country.

That they who are reared so differently do so very well in life raises important questions, such as what kind of mothering or family life is necessary to create a successful personality type in our times.

The presentation will stress what it means if in the center of emotional attachment and loyalty stands not the primary family group but a peer society, and what the differences are in personality formation which ensue from such a way of child rearing.

A film will further illustrate this unique educational experiment.

### Film Lecture V (30 Dec.)

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

*Ethnographic Filming and the Netsilik Eskimos.*

The aim of the lecture is to illustrate the traditional migration cycle of a Netsilik band prior to the introduction of rifles in the area. This implies a certain amount of cultural reconstruction. The film units correspond to the different Netsilik camps of the annual migration cycle, each characterized by a particular subsistence technique: seal hunting in spring or winter, salmon fishing, or caribou hunting. The related social activities are explored in great detail. Although ceremonial and ritual are not neglected, emphasis is placed on ecological adaptation, this reflecting contemporary anthropological interest in human survival in a harsh environment.

## AAAS COMMITTEE SYMPOSIA

### Power Generation and Environmental Change: Reconciling Man's Desire for Power with the Needs of His Environment (28 Dec.)

Arranged by Arthur M. Squires and David Berkowitz.

Power generation on the earth is a large-scale engineering enterprise with complex environmental effects. In the future development of the power resource, the challenge to man's ingenuity will be to develop means for minimizing adverse effects and preserving environmental quality. The societal pressure for more power will not decrease; a societal value for environmental quality must be encouraged and the technological means must be sought for reconciling the desires of man with the needs of his environment.

This symposium will consider the three primary means of generating power: nuclear, hydroelectric, and fuel combustion. What are the environmental effects of each, and what can be done to suppress or control them. Nuclear generating plants, and nuclear fuel processing plants release radionuclides to the environment in a variety of gaseous, liquid, and solid chemical forms. Hydroelectric dams change the landscape and produce direct change in the ecology of life systems in the newly formed lakes behind the dams and in the rivers in front of them and the larger bodies of water into which they drain. Fuel combustion pollutes the air with sulfur, nitrogen oxides, and smoke, and changes the balance of carbon dioxide in the atmosphere. In addition, the process of coal mining frequently scars the land and pollutes rivers with the mine drainage. In the process of generating power, the nuclear and fuel combustion plants waste heat which is delivered primarily to the water near the plants. Most of the usable power generated ultimately reaches the environment in the form of heat. In another few decades, the amount of power generated by man will perturb the heat balance of the earth.

The purpose of this symposium is to introduce the ways of generating power, to consider their various effects from an enviromental point of view, and to review the technological means available for controlling certain of the environmental interactions.

*James A. Fay, Merrill Eisenbud, Arthur Tamplin, Floyd L. Culler, Karl F. Lagler, Wallace B. Behnke, Jr., Gordon A. MacDonald, Harry Perry, Erik Eriksson, Meyer Steinberg, Arthur Squires, Lamont C. Cole, Walter Belter, Clarence A. Carlson, Jr., Robert T. Jaske, S. Fred Singer, Fred E. Smith, and William H. Steigelman.*

### Academic Research and the Military (29–30 Dec.)

Arranged by Walter Modell.

The symposium is designed to probe into the past, present, and future consequences of the support of nonclassified academic research by the Department of Defense. It will survey subtle as well as gross effects on the character of the university as well as on progress in defense sciences. The nature and extent of military support of apparently nonmilitary academic research will be detailed. Case histories will be recounted. The divergent views of those directly involved and of outsiders will be stated. The future of the university, the future of defense sciences and of the relation between the military and the university will be discussed.

*Walter Modell, Charles W. Shilling, William M. Capron, Noam Chomsky, Robert Morison, George E. Pake, James A. Shannon, Kalman H. Silvert, Hudson Hoagland, Robert Ross, William Kaufman, Kenneth Prewitt, Martin Meyerson, F. Joachim Weyl, and Sidney Morgenbessen.*

## AAAS GENERAL SYMPOSIA

### Arms Control and Disarmament (26–27 Dec.)

Arranged by Herman Feshbach.

The arms race poses a threat for human survival. As the available destructive power escalates and becomes more sophisticated, the present strategic balance becomes more delicate and we are all the more insecure. The development of effective arms controls is then a crucial part of our national policy. The problems and prospects for arms control will be discussed. The present thinking behind arms control plans, and the resulting technical problems, will be delineated. The various elements making up the strategic balance will be examined. These include a detailed consideration of the economic impact of the arms race, the threat of new but as yet undeployed weapons systems, the chemical and biological weapons, and the very great improvement in the technology of surveillance.

*George Kistiakowsky, Jerome Wiesner, George Rathjens, Frank Long, Alexander Rich, J. P. Ruina, Herbert Scoville, Jr., Jeremy Stone, and Bernard Feld.*

### Technology Assessment and Human Possibilities (26–27 Dec.)

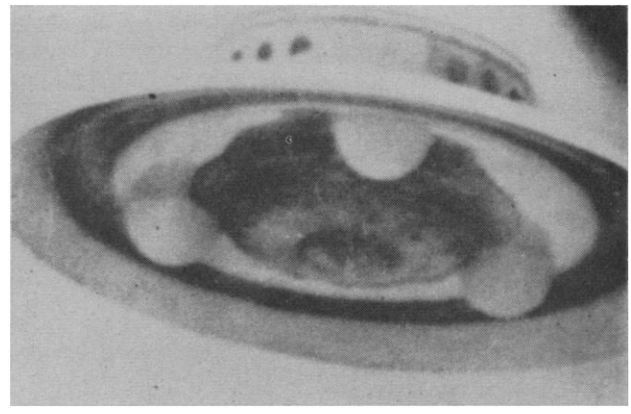
Arranged by Athelstan Spilhaus, Bruce Welch, Bentley Glass, Dael Wolfle, John S. Coleman, Walter G. Berl, and Richard Carpenter (*chairman*).

*Athelstan Spilhaus, Milton Katz, Chauncey Starr, Richard A. Carpenter, Ivan Bennett, Emmanuel Mesthene, Barry Commoner, Harold Green, Garrett Hardin, Edward Wenk, Jr., Kenneth Boulding, Morris Tannenbaum, H. Bentley Glass, and C. Jelleff Carr.*

### Unidentified Flying Objects (26–27 Dec.)

Arranged by Thornton Page, Philip Morrison, Walter Orr Roberts, and Carl Sagan.

The symposium is intended to demonstrate the application of scientific methodology to a contemporary controversy and to acquaint scientists with the wide variety of facts and interpretations. It is not expected that any firm conclusion will be reached about "the correct interpretation" of the imperfect and differing data available. Presentations and discussion should be of interest to astronomers, physicists, meteorologists, sociologists, psychologists, and educators.



U.F.O., telescopic photo taken by the late George Adamski. [Madeleine C. Rodeffer, Silver Spring, Md.]

*Walter Orr Roberts, Thornton Page, Franklin Roach, William Hartmann, Robert Hall, Douglass Price-Williams, Lester Grinspoon, Carl Sagan, J. Allen Hynek, James E. McDonald, Donald H. Menzel, R. M. L. Baker, Jr., Kenneth R. Hardy, Frank Drake, Walter Sullivan, Allan D. Persky, and Philip Morrison*

### Hunger and Malnutrition (26–29 Dec.)

Arranged by Jean Mayer.

The symposium will look at the whole range of problems which are related to nutrition in a large and diversified country like the United States. How do we detect malnutrition; which standards do we use to determine what is acceptable and what is unacceptable; what are the problems of nutrition specifically related to poverty; what are those which are related to our very wealth and abundance; what are the problems of special groups (such as Indians, Eskimos, and inhabitants of trust territories) and special ages such as advancing old age with attending poverty, loneliness, infirmity, and special states such as illness? The symposium will look at some of the economic problems involved in dealing with nutrition, particularly at the economy of food distribution and appraisal by the consumer of what he is buying. Finally, some of the psychological and sociological implications of modern food practices will be examined.

*Jean Mayer, Roger Revelle, John H. Brown, Mark Hegsted, H. L. Sandstead, Frederick J. Stare, Jules Hirsch, Albert Kattus, Ancel Keys, Robert S. Harris, William J. Darby, Helen Ger Olson, Nevin S. Scrimshaw, Charles Glenn King, Jack Geiger, Donald Watkin, Willard Krehl, Colston E. Warne, George Brandow, James Carmen, Johanna T. Dwyer, Margaret Mead, Norman W. Desrosier, Robert Choate, Effie Ellis, Arnold E. Schaefer, Senator Charles E. Goddell, and Joaquin Cravioto.*

### Science and Music (A Concert/Symposium) (27 Dec.)

Arranged by Alan A. Smith and Milton B. Babbitt.

The musical sources and motivations for sound synthesis

and the use of electronic media are clarified by discussion and example. There is confusion among the musical categories involved, but, in fact, the issue is clear-cut—the term "electronic music" is imprecise. Musical innovation and technological innovation are now interrelated. The implications for the music of the future will become apparent to those who can listen.

*David Epstein, Milton B. Babbitt, Vladimir Ussachevsky, and James K. Randall.*

**Chemical and Biological Warfare (27 Dec.)**

Arranged by Daniel M. Singer.

This symposium aims to present the present status, potentialities, and technical limitations of anti-personnel chemical and biological (bacteriological) weapons of war and to explore ethical and moral aspects associated with usage of such weapons, their possible impact on combatant and civilian populations. National and international policy questions will be considered regarding support or prohibition of research, both defensive and offensive, field testing, stockpiling, and use of chemical and biological weapons.

*Arthur W. Galston, Albert E. Hayward, Ivan L. Bennett, Jr., Stuart A. Rice, Victor W. Sidel, Richard D. McCarthy, Alexander Rich, and Matthew S. Meselson.*

**Manned Lunar Space Program (27–29 Dec.)**

Arranged by Paul Rosenberg.

The historical and remarkably successful flight of Apollo 11 has given impetus to man's exploration of space and extraterrestrial bodies. It has become more important than ever before to plan the future of the space program and establish its goals; to assess the potential contributions of manned space flight to science, and the support which science gives to manned space flight; and to utilize, in programs other than space programs, the remarkable engineering and management skills, such as reliability and safety, that were developed in the manned lunar space programs. A series of three panels on three successive afternoons will discuss these subjects.

*Homer E. Newell, Harold C. Urey, Philip H. Abelson, Harold Masursky, Raymond L. Bisplinghoff, George H. Hage, Jerome Lederer, Arthur Kantrowitz, C. Stark Draper, Edwin E. Aldrin, Jr., and Albert J. Kelley.*

**The Sorry State of Science—A Student Critique (28–29 Dec.)**

Arranged by Allen S. Weinrub.

The advance of science holds forth great responsibilities for the freeing of mankind from the forces of nature and social oppression. Yet our understanding of man and the physical world in which he lives has not been directed toward these humanistic ends. Instead, science and technology are used to strengthen militarism and to further the economic exploitation and psychological domination of the world's population. How this misuse of science and technology takes place can only be understood by considering the social and economic context within which technological advance occurs. Who develops new technology, who benefits from its use, and who pays the social costs which result from this use?

The first session of this two-part symposium will develop an analysis of the social and economic framework of technological innovation. Several case studies will be provided in support of the thesis presented. The second session will focus attention on the role of scientists and engineers in relation to the misuse of their work and abilities. The session will also explore approaches, consistent with the analysis presented, that can be taken toward directing the application of science to social needs and human welfare.

*Mark Tuttle, Allen S. Weinrub, Steve Cavrak, Rick Paul, Steve Kaiser, Larry Beeferman, David Guttman, and Don MacKensie.*

**Science and the Future of Man (28–29 Dec.)**

Arranged by Robert L. Carovillano and James W. Skehan.

The symposium will analyze the role of the scientist and science in society. The contributions of science—both positive and negative—to our technological society and its most urgent problems will be studied, and ways in which science and scientist can contribute to a better society will be sought. Perspectives will be historical, immediate, and long range. Historical—Issues and events relative to the role scientists have played in society in the past will be reviewed. Topics will include the development and effects of modern medicines, communications, transportation, weapon systems, nuclear energy, government macrofunding of science, and the scientist's past role in public policy. Immediate—Discussion will center on the vital present-day needs of society, both national and international, both urban and rural; the influence of science on national and international politics; the activities of the scientist in the university, in government, in industry. Long Range—Attention will focus on questions for the future; What are the best scientific objectives for society now? Where is society going? How can the scientist as an individual and as a member of a scientific community become a more effective and constructive force in society? How can environmental research be applied to urban problems, overpopulation, genetics, hunger, poverty? How can society be made aware of scientific developments directly affecting its future?

*Donald Hornig, Paul Parks, Athelstan Spilhaus, J. Tuzo Wilson, Franklin A. Long, John R. Platt, George Wald, Victor F. Weisskopf, Lewis Mumford, Edward M. Muskie, V. J. Yannacone, Jr., and Philip Abelson.*

**The Identity and Dignity of Man: A Scientific and Theological Dialogue on Issues Emerging from Behavioral, Surgical, and Genetic Interventions (28–30 Dec.)**

Arranged by George P. Fulton and Preston N. Williams.

The purpose of the conference is to engage leading life scientists, theologians, and social ethicists in dialogue on issues related to the ethical problems emerging from the biotechnological revolution and the heightened concern for the preservation and enhancement of human identity

and dignity. This will be accomplished by keynote addresses, panel discussions, and workshops concerned with three primary areas, one each day: I. Control of Population (through food supply and contraception and regulation of behavior through neurological intervention); II. Extension of Life through Organ Replacement; and III. Improvement of the Quality of Life through Genetic Manipulation. The keynote addresses will endeavor to underline the primary issues and serve as preparation for the panel discussions and workshop sessions. The panel discussions and workshops will consist of informal spontaneous interaction among the conference participants.

The first session of the conference will emphasize overpopulation and associated problems in social behavior. Stress will be placed upon external controls such as contraception and food supply and internal controls such as manipulation of the central nervous system, especially the brain. The second session will discuss problems related to the extension of life by the replacement and transplanting of organs and the consequences of such intervention for questions of personal, social, and philosophical adjustment. Major consideration will be given to the generation of appropriate decision-making processes for the allocation of resources.

The interrelated findings of the three components, summaries of the workshops, and conclusions of the conference will be presented at an evening banquet on the final day.

*Walter G. Muelder, Hudson Hoagland, Roger L. Shinn, Charles E. Curran, Ernst Mayr, Frank Ervin G. Evelyn Hutchinson, Irwin Sanders, Paul Deats, Joseph Speisman, Joseph Fletcher, George P. Fulton, Francis D. Moore, L. Harold DeWolf, Paul Ramsey, Henry K. Beecher, John A. Mannick, Ralph B. Potter, Preston Williams, Bernard D. Davis, James M. Gustafson, Hans Jonas, Isaac Asimov, Anthony Blackler, John R. Platt, Robert S. Schwartz, and Dorothea Raacke.*

## Human Settlements and Environmental Design (28–30 Dec.)

Arranged by Aristide H. Esser, Gyorgy Kepes, David Lowenthal, and Raymond G. Studer.

Human Settlements and Environmental Design is a 3-day symposuim to discuss the planned and unplanned interactions of man and his environment.

The first session will trace the origins of various circumstances leading to social dysfunction, to be discussed in Session II. Attention will be focused on the dichotomized thinking about nature and culture and the evolution of physical expressions of community and privacy.

The second session will explicitly identify conflicts among existing behavioral patterns, as well as disparities between these patterns and broad social objectives. On the basis of these dysfunctional aspects, the bearing of specific environmental structures will be discussed.

The third session covers such wide areas, that it can only attempt reviews of basic principles in behavioral research which leads to definitions bridging the gap between behavioral science and the design community. The discussion of this session is of special relevance to Session V.

The fourth session will focus on the socioenvironmental factors influencing the planning of and personal involvement in various life settings. The essential nature of homelife, work, leisure, and recreation will be explored as a basis for the discussion.

The final, 1-day session, addresses issues related to new environmental systems which move outside conventional configurations. These new systems offer alternatives to human settlements as we know them. In the first part, the emphasis will be upon the implementation of emerging scientific and technological tools. The second part will focus on the integration of artistic intuition, design principles, and the behavioral sciences.

*David Lowenthal, Clarence Glacken, Leo Marx, Hugh A. Prince, Stephen Carr, J. Ralph Audy, Marvin W. Mikesell, William A. Koelsch, Aristide H. Esser, Harold Haskins, Peter Labovitz, Yi-Fu Tuan, Matthew P. Dumont, Nathan Glazer, Bernard M. Kramer, Florence Ladd, Constance Perin, John A. Buggs, M. Lawrence Heidemann, Jr., Richard Chase, Israel Golddiamond, Bernard P. Spring, Irwin Altman, Kenneth H. Greik, Ido DeGroot, Andrew F. Euston, Jr., Bernard Kaplan, Kevin Lynch, B. L. Driver, Rolf Meyersohn, William R. Catton, Jr., Larry W. Tombaugh, Samuel Z. Klausner, William R. Burch, Jr., James G. Kelly, Hugh C. Davis, John B. Lansing, Roy I. Wolfe, Jerome Wiesner, Hassan Fathy, James M. Fitch, Donald A. Schon, John McHale, Gyorgy Kepes, Topper Carew, Hermann H. Field, Carl O. Hodge, Karl J. Ingebritsen, Alfred Kazin, Donlyn Lyndon, Michael Michaelis, Robert B. Choate, Morton Hoppenfeld, and Raymond G. Studer.*

## Innovation (29 Dec.)

Arranged by Howard O. McMahon.

Innovation in science, technology, and our social institutions is essential to our rapidly evolving society. But problems arise out of the fact that our understanding of the innovative process is at best imperfect. For example, is innovation something that can be taught and learned? Can engineers be taught to utilize existing scientific knowledge more imaginatively? Or, put another way, if concentration on engineering sciences may be properly called engineer*ics*, what is required to teach engineer*ing*? An absolute necessity for industrial innovation, especially when it appears as a new product or new company, is the technological entrepreneur. What are the special characteristics of the technological entrepreneur; what are the ingredients of his personal background and characteristics which predispose him to innovate activity? Business is becoming aware of the need to innovate more and better; the trend toward internal venture groups in large corporations indicates industry's concern for stimulating entrepreneurial innovations from within. There are problems in the larger context as well—for example, that of redirecting groups of people toward new goals when it is appropriate to focus on a new mission.

Finally, and perhaps of greatest urgency, we must adopt an innovative approach in our interactions with communities and their array of difficult problems. As we come to apply technology, broadly construed, to the solution of social problems, the system in which change and renewal must occur encompasses increasingly large num-

bers of people and deals with increasingly complex subject matter.

*Howard O. McMahon, Myron Tribus, Edward B. Roberts, Alvin M. Weinberg, and Donald A. Schon.*

### The Behavioral and Social Sciences: Outlook and Needs (29 Dec.)

Arranged by Stephen Viederman.

Increased interest in the behavioral and social sciences as contributors to social problem solving has raised a number of questions concerning the scale of social research and organizational needs both for training and research. Discussion in the legislative and executive branches of the government, as well as in the press, of national data systems, social indicators, an annual social report, and a council of social advisers all call attention to changes occurring and necessary in these fields of science if they are to be most effective.

The session is occasioned by the publication of the report of the Behavioral and Social Sciences Survey Committee, *The Behavioral and Social Sciences: Outlook and Needs*. The papers, by the chairman and co-chairman of the Committee, will focus attention on the major findings of the report and its recommendations for action in the future by the federal government, the professions, universities, and others.

*Don K. Price, Ernest R. Hilgard, Henry W. Riecken, Bernard Berelson, Joseph L. Fisher, and William Gorham.*

### Is There an Optimum Level of Population? (29–30 Dec.)

Arranged by S. Fred Singer.

We have become increasingly aware of the fact that a population problem exists not only in some of the less-developed countries but right here in the United States. This fact has become most apparent in our overcrowded cities where traffic, pollution, and social pressures are producing concern—to name but a few problems. President Nixon has called for the establishment of a Commission on Population Growth and the American Future, thus recognizing the importance of the problem at the highest governmental level. But before policies can be fully developed, it is necessary to understand the goals more completely. Is there an optimum level of population for the United States, for example? What do we mean by "optimum" and how does it depend not only on the level but also on concentration and rates of growth? Traditionally, food has been considered as the important limiting factor on a growing population but there are many other limiting factors which may be more relevant in a particular situation. It is important to understand the relation between a given factor, such as environmental quality or health services, and the demographic parameters which describe the population. It is important also to develop a methodology which allows one to make predictions and to model what will happen. We need to understand also the interaction between various factors. Out of such discussions and studies comes a better understanding of the implications of population growth to the quality of life and, therefore, an important body of information which can form the basis for setting policies for governmental and private actions.

*Roger Revelle, Preston E. Cloud, Jr., Harrison Brown, Joseph L. Fisher, Alvin M. Weinberg, Chauncey Starr, Sam H. Schurr, S. Fred Singer, Walter O. Roberts, Christian DeLaet, Philip Handler, Lester R. Brown, Ivan L. Bennett, Jr., William Paddock, Philip R. Lee, John M. Knowles, Victor R. Fuchs, H. Bentley Glass, Barry Commoner, Harold A. Thomas, Jr., Bernard Berelson, Werner Z. Hirsch, Ezra Glaser, Philip M. Hauser, Norman Glass, Lincoln Day, John B. Calhoun, Joseph Spengler, Athelstan Spilhaus, Garret Hardin, Harvey Leibenstein, and Margaret Mead.*

### Rational Use of Water (30 Dec.)

Arranged by Chauncey Starr.

The development, management, and conservation of water is a principal concern of the process of social decision making, and the rational use of water is an objective sought by every society. The problem has been made more complex by the addition to the traditional system of agriculture, urban centers, and industry, of the modern interest in recreational facilities involving natural or artificial water bodies.

Because modern transportation of agricultural products —food and fiber—may often be undertaken more easily and at less cost that the transportation of water, one of the traditional constraints in the allocation of water resources is minimized. In the absence of artificial trade barriers, as within the United States, the problem of allocation of water can be examined on a very large regional basis, and the effect of modern commodity transportation can play a significant role.

The interaction between agricultural use and urban use of water represents a principal issue in allocation policy. A key question is the amount of agricultural use necessary to sustain an urban economy.

Although agriculture is by far the most expensive application of water in relation to the economic value of its output, it also has a special role of stimulating and supporting large-scale water supplies. Agricultural irrigation systems provide a continuous summer load as contrasted with the peaking characteristics of urban use, and, therefore, large-scale agricultural irrigation rarely requires expensive regulatory storage facilities, and distribution conduits are far less costly. From the point of view of investment economics, agricultural water can be put to use almost immediately and thus begins to pay off the capital investment in water supply quite quickly.

Because of these features of agricultural use, as well as the importance of its product, agriculture has historically been the initial and pioneering venture in developing any area.

*Chauncey Starr, Michael F. Brewer, Everard M. Lofting, Lloyd E. Myers, and Dean F. Peterson.*

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Programs of the AAAS Sections appear on the following pages.

# Mathematics (A)

## Vice Presidential Address (28 Dec.)

Speaker: Mark Kac.

*Is the Computer Merely a Tool?*

[U.S. Department of Housing and Urban Development]

## Quantitative Studies of Urban Problems Part I. Operations Research Contributions (27 Dec.)

Arranged by David M. Boodman.

As our planet becomes increasingly urbanized, the resultant concentrations of population produce pressures on available resources required by urban centers, as well as frictions among the inhabitants of these centers, which make it necessary for us to understand the functions and methods of operation of an urban center in order that the resources and services required by that center be properly supplied. The city is for most of us a place where people are housed, fed, transported, educated, protected, and provided services, such as medical care. Social scientists have in the past been the principal source of what little understanding we have of urban operations and the behavior of people in an urban environment. Operations research scientists have in recent years made efforts to apply their points of view and their particular techniques to urban problems aimed generally at the provision of better methods for the management of scarce resources, both in terms of the material resources required by the city and the services needed to operate and maintain it. This session presents a sampling of the problems undertaken by operations research scientists and the approaches applied in bringing to bear the methods of mathematics and the physical sciences in dealing with these complex problems.

*David M. Boodman, Franz X. Birkner, James E. Murphy, John M. Wilkinson, David I. Hellstrom, and Alfred Blumstein.*

## Quantitative Studies of Urban Problems Part II. Mathematical Contributions (27 Dec.)

Arranged by Hirsch Cohen and Denos Gazis.

This program will present some current work in the application of mathematical analysis to problems that arise in cities. While the human and physical difficulties of modern urban life will never be resolved by mathematical treatment alone, there are aspects which we may hope to understand better through mathematical formulation. Among these, specifically to be discussed in this program, are the planning of housing projects, the control of automobile traffic in urban areas, and the locating, manning, and dispatching of ambulance, fire, and other emergency units. In presenting these particular discussions, it is intended to exhibit, on one hand, to mathematicians how they may contribute to the easing of urban difficulties. To other workers already engaged in the problems of the cities, it is hoped that this program will suggest areas of collaboration which they may undertake with their mathematical colleagues.

*Mark Kac, S. Savage, L. Edie, and Denos Gazis.*

## Some Mathematical Questions in Biology (27 Dec.)

Arranged by Murray Gerstenhaber.

This is the fourth in a series of annual symposia whose purpose is to stimulate direct contact between biologists with some mathematical background and mathematicians. Most of the speakers are biologists who will address themselves to questions which are primarily of biological interest, but in which some mathematical analysis is involved. The morning session is devoted to models of developing organisms, and the afternoon session to models of the brain.

*Murray Gerstenhaber, Morrel H. Cohen, Brian C. Goodwin, Stuart Kauffman, Jack D. Cowan, George L. Gerstein, Vernon Mountcastle, Wilfred Rall, and Jerome Y. Lettvin.*

## Computers in Mathematics and Science (28 Dec.)

Arranged by Mark Kac.

*Frederick A. Ficken, Mark Kac, James W. Givens, Jr., J. T. Schwartz, and S. M. Ulam.*

## Electronic Computers—Today and Tomorrow (28 Dec.)

Arranged by Carl Hammer.

Recent advances in the state of the art will be surveyed and explored. The impact of electronic computers upon the remarkable progress made by all branches of science will be related to the advances made in the computing sciences over the past two decades. Significant aspects to be discussed will include the theory of computing, development and use of computer languages, new areas of application, and interactions between man and machines. The expository and survey type presentations will be of interest to behavioral and experimental scientists who may be acquainted with some aspects of electronic systems. They will also benefit researchers not familiar with modern computer applications.

*Carl Hammer, Joseph F. Traub, A. C. Williams, Peter Wegner, Carl Engelman, David Brandin, Alan M. Hershdofer, and John W. Brackett.*

### Mathematical Logic (30 Dec.)

Arranged by Hartley Rogers, Jr.

The last 5 years have seen a remarkable growth in mathematical logic (also known as "symbolic logic") and in the applications of logic to other parts of mathematics. The symposium will describe and discuss some of this work and its implications. These developments are of fundamental interest to scientists outside mathematics, because mathematical concepts have become an increasingly inseparable part of the theories and vocabulary of modern science.

*Willard Van Orman Quine, Hartley Rogers, Jr., Martin D. Davis, Gerald E. Sacks, Donald A. Martin, Abraham Robinson, and Frank A. Wattenberg.*

### Mathematics Education (30 Dec.)

Arranged by John C. Egsgard.

The material presented should be of interest to teachers of mathematics, administrators, and others who are interested in the use of computers in secondary schools or in the effect of the College Board Examinations on classroom teaching. A display of NCTM materials will be supplied.

*Morton D. Wienert, John C. Egsgard, C. Rodgers Close, Jean M. Prendergast, and W. Eugene Ferguson.*

## Physics (B)

### Vice Presidential Address (29 Dec.)

Speaker: Nathaniel H. Frank.

*The Learning of Physics in Professional, Vocational, and General Education*

The study of physics (or, more generally, of science) as part of professional, vocational, and general education is discussed in terms both of the goals of such educational undertakings and of the problems of optimizing the learning processes for the several objectives.

A professional physicist evidently requires the acquisition of relatively sophisticated mathematical and experimental working techniques in addition to adequate insight, understanding, and judgment of the field of physics. For other professions and vocations that are based largely on the physical sciences, insight and quantitative understanding of physics are necessary but the requisite working techniques are conditioned largely by the special profession or vocation. Investigative learning patterns that capitalize on the learner's special interests are suggested by the speaker.

Apart from cultural goals, the concern of general education with social problems and the human condition demands as a primary need the acquisition of technological "literacy," sufficient to insure sound judgments about technology. Since the science-based technologies constitute largely the growing mass of sophisticated technology that has increasingly major social consequences, the requirement of insight and understanding of the underlying sciences is vital. Problems of generating effective continuing learning patterns for this purpose are discussed during this address.

### Whither Lunar and Planetary Exploration in the 1970's? (26–28 Dec.)

Arranged by Donald G. Rea and Donald U. Wise.

*Donald G. Rea, Bruce C. Murray, Wolf Vishniac, Richard M. Goody, Seymour L. Hess, Don L. Anderson, Donald U. Wise, Frank Press, Paul W. Gast, Eugene M. Shoemaker, Wilmot N. Hess, John W. Findlay, John E. Naugle, Gordon J. MacDonald, Carl E. Sagan, Lewis M. Branscomb, and S. Fred Singer.*

### Some Problems in Physics of Fluids (28 Dec.)

Arranged by Francois N. Frenkiel.

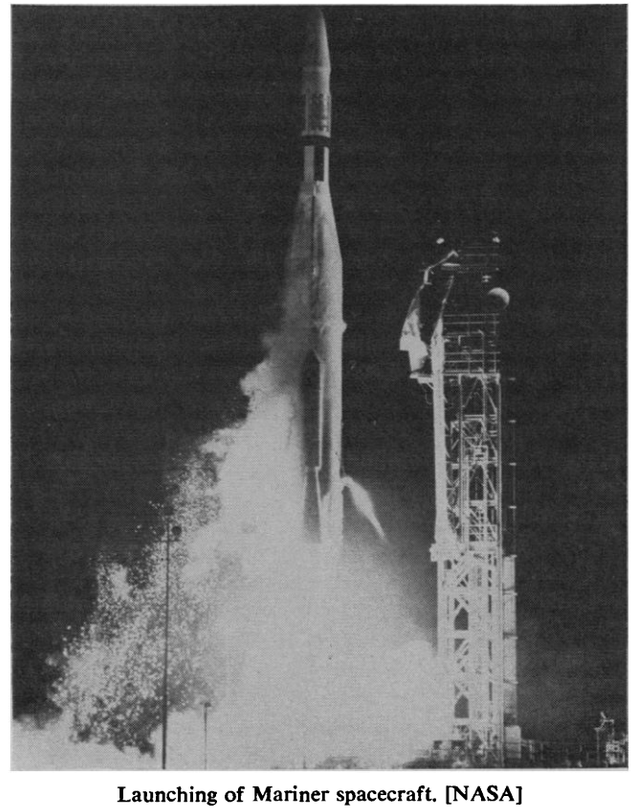
*Francois N. Frenkiel, Harry E. Petschek, E. L. Resler, Jr., and S. J. Buchsbaum.*

### X-ray and Gamma-ray Astronomy (29 Dec.)

Arranged by Herbert Friedman.

Although searches so far have been restricted to a few small rockets and balloons, some 40 discrete x-ray sources have already been resolved against a diffuse, nearly isotropic background radiation. The strongest source is about 2000 times as bright as the weakest detectable with present rocket instruments. Nearly all of the discrete sources lie in the spiral arms of the Milky Way. Variability is a common feature.

Flare-like outbursts up to four times the normal brightness and lasting some tens of minutes have been observed. Two sources have appeared suddenly, risen to maximum brightness, and decayed with time in a manner similar to the behavior of novae. One x-ray source at high



Launching of Mariner spacecraft. [NASA]

galactic latitude is identifiable with a distant radio galaxy, Virgo A, and its x-ray luminosity is 70 times its radio power.

Two sources, the Crab Nebula and Sco XR-1, have been studied most intensively. X-rays are emitted from an extended region of the Crab Nebula, about 2 light years in diameter, that contains a pulsar at its center. The pulsar has been observed in the radio, visible, and x-ray spectrum at a frequency of 30 pulses per second. Its x-ray power exceeds its optical by a factor of 200 and radio by a factor of $10^4$. Sco XR-1 coincides with a blue star-like object of 12th magnitude and its x-ray spectrum fits a thermal bremsstrahlung model at $T \sim 5 \times 10^7$ °K in the range 1 to 10 Å. However, the full spectrum from 0.05 Å to radio wavelengths is more closely approximated by synchrotron radiation.

Gamma-ray astronomy has recently claimed the first evidence of a point source. That such sources must exist seems almost inevitable on the basis of what we now know of x-ray sources. But the expected gamma-ray photon fluxes are very much weaker than x-ray fluxes and the background noise problems at balloon altitudes are especially severe. Diffuse gamma-ray emission from the galactic plane in the direction of the galactic center has been observed from satellites. The measured intensity is an order of magnitude higher than was expected and raises important questions with regard to interstellar gas density, cosmic ray flux, and infrared background radiation.

The entire sky is filled with a diffuse x-ray background radiation which seems to be resolvable into at least two components: hard x-rays (1 to 1000 kev) may be associated with the interaction of cosmic rays and the microwave photons of the cosmological 3-kev background; soft x-rays ($< 1$ kev) may originate as bremsstrahlung from hot intergalactic gas. If the bremsstrahlung interpretation is correct, most of the matter in the universe is observable only by means of its x-ray emission.

*Herbert Friedman, George W. Clark, and Giovanni G. Fazio.*

### Space Astronomy (30 Dec.)

(Engineering & Systems for Astronomy Satellites)
Arranged by William N. Gardner.

The use of satellites to gather astronomical data in various regions of the electromagnetic spectrum often poses unique problems in spacecraft design. In some instances, stringent requirements are placed on platform stability, precision pointing capability, and structural rigidity. Long wavelength radio astronomy satellites require extended antennas with attendant problems in deployment, stability, and attitude control. Some applications require unique capabilities in data processing, storage, and transmission. In other applications, the need for carefully controlled temperatures raises problems in satellite thermal control.

The solution of such problems requires close cooperation between the astronomer and the spacecraft systems engineer.

*Francis W. French, Rein Ise, David L. Blanchard, David Bogdanoff, Harry Wolbers, Joseph W. Wechsler, and Nicholas Cinder.*

## Chemistry (C)

### Recent Advances in Clinical Chemistry (26 Dec.)

Arranged by Sidney Green.

In recent years sufficient advances have been made in newer analytical techniques as well as in instrumentation so as to gain a better appreciation of the fundamental biochemical moieties associated with normal and abnormal metabolic processes. Consequently, clinical chemistry is currently entering a new dimension of refinement and sophistication in fulfilling its traditional role of aiding in differential clinical diagnosis.

*Sidney Green, Aaron O. Lurie, William H. Fishman, Robert S. Lees, and Robert S. Melville.*

### The Total Synthesis of Food (27–28 Dec.)

Arranged by Leo Schubert.

Recent work on such new developments as "miracle" wheat and rice and the increasing use and effectiveness of fertilizers, insecticides, and other modes of increasing agricultural productivity have improved radically the food outlook for the world.

Alternately, interest has been developing in the feasibility of the "total synthesis of food" to borrow an analogy, many natural products are now being synthesized. Even some foods, such as vitamins, are being synthesized. It appears to be useful to examine the synthesis of foodstuffs as an adjunct to or perhaps replacement of food from natural resources.

This subject will be examined from nutrients to be added to natural foods to the possibility of the synthesis of the foodstuff itself. The synthesis of proteins and other nitrogen sources, fats, and carbohydrates and their organoleptic, flavor, and consistency properties will be discussed. An overview of the food industry to backdrop the problem will be presented.

*Charles G. Overberger, Sidney Fox, Constance Kies, N. O. V. Sonntag, Horace S. Isbell, Jacob Shapira, Clinton L. Brooke, E. A. Day, M. E. Mason, Herman Mark, Murray Goodman, Mary Nan Steel, Lewis B. Nelson, F. D. Wharton, Jr., Lloyd J. Filer, Robert E. Hodges, and Willard Krehl.*

### Biomedical Materials (29 Dec.)

Arranged by Fred Leonard.

Sophisticated scientific achievements over the last two decades in an often poorly defined, interdisciplinary area that lies between the biological and physical sciences, have led to the design and development of implantable devices capable of monitoring and sustaining life processes. One of the limitations to the long-term use of such devices is the lack of tissue compatible materials to be used in their construction. At the present time, research toward the development of such materials is being carried out in laboratories all over the world.

In this symposium research will be presented on the synthesis, testing, and evaluation of materials for a variety of potential biomedical applications. It is hoped that this forum will provide for an interchange of information and

result in the stimulation of further research in this important medical field.

*Fred Leonard, F. Hastings, Lowell T. Harmison, Vincent T. Gott, Richard L. Kronenthal, Albert L. Rubin, Evan H. Greener, Miguel F. Refojo, R. K. Kulkarni, and Stephen C. Woodward.*

### Mendeleev Centennial (29 Dec.)

Arranged by Leo Schubert.

It was 100 years ago that Dmitri Ivanovitch Mendeleev published the Periodic Table. This Table provides the physical sciences with its most comprehensive system of classification. It has proved to be a predictive tool of great strength. The concept of periodicity so firmly established in this Table continues to be of use. This is shown strikingly in the work on the transuranium elements and in some of the newer thinking on the structure of the nucleus.

The genesis of the Table will be discussed. The atomic weight work of T. W. Richards at Harvard, which did so much to authenticate the Table, will be reviewed. The use of the Periodic Table in the discovery of the transuranium elements will be examined. Finally, extrapolation of the Table to periodicity within the nucleus will be examined.

*Anatoliy F. Dobrynin, Leo Schubert, O. Theodore Benfey, James B. Conant, Glenn T. Seaborg, and Herman Feshbach.*

## Astronomy (D)

### Space Astronomy (29 Dec.)

Arranged by Michael D. Papagiannis.

Observations from the ground are restricted in the optical and radio windows of the terrestrial atmosphere, while the gamma-ray, x-ray, ultraviolet, infrared, and low radio frequency regions of the spectrum remain inaccessible to the ground-based observer. With the advent of the space age and the parallel development of the necessary technology, we have been able to extend our astronomical observations practically over the entire range of the spectrum. The results have already been very rewarding (for example, the unexpected discovery of several discrete x-ray sources) and will undoubtedly become even more so as future technological developments will make possible the installation of instruments of higher power and higher resolution on larger and more elaborate space platforms. Special emphasis will be given to the recent results of the Orbiting Astronomical and Solar Observatories (OAO-II, OSO-IV, and OSO-VI).

*Michael Papagiannis, Leo Goldberg, Edmond M. Reeves, Arthur D. Code, Robert J. Davis, Tobias C. Owen, and Frank J. Low.*

### Recent Developments in the Field of Pulsars (30 Dec.)

Arranged by Michael D. Papagiannis.

The symposium will review the numerous new developments in the field of pulsars during 1969. A similar symposium, chaired by Frank Drake, was held with great success at the 1968 annual meeting of the AAAS in Dallas, Texas. Many new exciting surprises have occurred during the past year in this new frontier of astronomy. The detection of optical and x-ray pulses from the NPO532 pulsar in the Crab Nebula, the discovery that the periods of the pulsars are increasing though occasionally they might display a brief reversal of this trend, and the strong evidence that pulsars are directly related to past supernovae are some of the important new developments in this field. Pulsars undoubtedly represent one of the most interesting stages in the evolution of certain stars.

*Michael D. Papagiannis, Frank Drake, David H. Staelin, and Stephen P. Maran.*

## Geography and Geology (E)

### Panel Discussion on Biology of Cave and Deep Sea Organisms: A Comparison (27 Dec.)

Arranged by Thomas L. Poulson.

To focus on some of the following topics: life history and parental care; reproductive cycles and clocks; food supply as a possible limiting factor; hypertrophy of sensory systems and the meaning of limb attenuation; bioenergetics, diversity (species number and relative abundance), and steno- versus eurytopy.

*Thomas Poulson, Howard Sanders, Donald Rhoades, John Teal, Amy Schoener, Stewart Peck, Razneat Darnell, Ruth Turner, Gilbert Rowe, and David Culver.*

### Deep Sea Drilling Project (JOIDES) Science and Resources (28 Dec.)

Arranged by M. N. A. Peterson.

The Deep Sea Drilling Project (Joint Oceanographic Institutions Deep Earth Sampling) is a momentous undertaking. This symposium will lead all the way from up-to-date report of the most recent cruise of the *Glomar Challenger*, through several of the broad subjects of current research in marine geology as affected by deep sea drilling, to implications concerning research in oceanography and effect on economic and national issues.

*M. N. A. Peterson, A. R. McLerran, Arthur E. Maxwell, Richard P. VonHerzen, N. Terence Edgar, John I. Ewing, William A. Nierenberg, Hollis Dole, Joshua I. Tracey, Jr., and Joe S. Creager.*

### Trading Areas, Tributary Areas, and Urban Regions (30 Dec.)

Arranged by John L. George.

Increased attention by American geographers has been centered upon the nation's urban centers. Central Place Theory has been one of the most active research frontiers and has stemmed from empirical studies carried out for location studies and urban analysis. Some efforts have been directed in the search for a method of delimiting urban fields incorporating statistical techniques. The increased emphasis upon urban areas and upon land uses within these areas is justified in light of the complexity of the problems and the attempts to revitalize economic activities within these urban areas.

*George K. Lewis, Richard O. Riess, William E. George, Martyn J. Bowden, John L. George, and Mildred Berman.*

## Zoological Sciences (F)

### Comparative Endocrinology of the Pineal (27 Dec.)

Arranged by Russel J. Reiter.

Our knowledge of pineal endocrinology has advanced rapidly within the past decade. Recent investigations have provided information as to the control of the endocrine system by the pineal as well as to the control of the pineal itself. It is the purpose of this symposium to present current work on the physiology of the pineal in a comparative manner. Five presentations will stress the endocrine aspects of the pineal gland. Some of the influences of the photoperiod on the neuronendocrine axis seem to involve the pineal as an intermediate; this is particularly true of the hypophyseo-gonadal axis. The sixth paper will concentrate on the factors regulating pineal activity and on the biochemistry of the proposed pineal hormones. A variety of substances, mostly methoxyindoles, appear to be potential pineal hormones. Biochemically, the pineal is highly active and exhibits several diurnal rhythms that are probably related to its endocrine function.

*Russel J. Reiter, Roger A. Hoffman, Joseph T. Bagnara, Charles L. Ralph, Wilbur B. Quay, and Julius Axelrod.*

### Aspects of Insect Endocrinology (28 Dec.)

Arranged by Franz Engelmann.

This symposium on Insect Endocrinology is intended to bring together speakers who have been active in a variety of fields that are currently of considerable interest to endocrinologists in general. The role of neurosecretion in reproduction, metamorphosis, or cardioacceleration has indeed been investigated for many years. The application of new and more precise experimental conditions, however, warrants the invitation of several speakers on these topics. Likewise, of great interest are the recent results concerning the action of insect hormones on biosynthetic processes. We are now able to deal with pure insect hormones and to study their role in molecular events. Furthermore, a discussion of the function of juvenile hormones and their analogs on biological and synthetic membranes should attract a broad audience to this symposium.

*Franz Engelmann, S. Kater, G. R. Wyatt, J. Zdarek, G. Fraenkel, G. Baumann, A. O. Lea, L. Hill, and K. C. Highnam.*

### Recent Developments in Animal Communication (28 Dec.)

Arranged by Peter Marler.

Four speakers will review advances made on several fronts in the study of animal communication. Chemical communication in insects is under intensive study by many investigators, but mammalian pheromones have received less attention. Some recent discoveries, that will be reviewed promise a new era of understanding of chemical communication in animals. Our interpretation of vocal communication in birds has rested largely on descriptive studies. The new insights stemming from study of responses to the playback of natural and artificial signals will be reviewed. Physiological investigations of sensory mechanisms involved in communication, long of interest to ethologists, are the subject of another talk. The final paper will review recent findings on social communication in nonhuman primates.

*Peter Marler, Katherine Ralls, Mark Konishi, and Steven Emlen.*

### Living Marine Resources of the Northeast (28–29 Dec.)

Arranged by Robert L. Edwards.

The east coast of the United States borders on one of the most productive continental shelf areas in the world. The land area is heavily populated and includes a major, highly concentrated industrial complex. The marine and land areas are interacting to a significant degree, quite probably mostly to the detriment if not the ultimate destruction, of the entire marine environment as we now know it.

Whether or not the various resources are being fully or properly utilized in any specific context is open for argument. It can hardly be argued, however, that man is not having a significant effect on the ecosystem. At the present time the area supports an enormous commercial fishery, an already sizeable and rapidly growing sport fishery, and serves as a convenient dumping ground for many of man's by-products. Recent geological studies suggest the strong likelihood of significant oil deposits, as well as other mineral resources.

In recent years, perhaps clearly for the first time, we can see changes being brought about by man's activities that are more significant in their scope than the natural cycles so long wondered at and studied.

The area is presently a prime focal point of international attention in the struggle to develop realistic principles for the management and regulation of living resources that are shared by many countries.

Decisions are being made every day that in one way or another are restricting the region's potential or affecting its future development. There is as yet no substantial documentation of the resources, of the possibilities for further development or of the degradation of the ecosystem. This symposium is a step in that direction.

*Richard C. Hennemuth, Albert C. Jensen, Herbert W. Graham, Lionel A. Walford, Marvin D. Grosslein, John A. Musick, Arthur S. Merrill, Roland L. Wigley, Vaughn C. Anthony, Virgil Norton, Harlan Lampe, Robert L. Edwards, Arkadi S. Noskov, John Ryther, John S. Gottschalk, and Donald L. McKernan.*

### Physiology of Annelids (28–29 Dec.)

Arranged by Charlotte P. Mangum.

This symposium is an attempt to integrate the diverse physiological information about annelids which has been accumulating at a great rate. The papers discuss most organ systems and aspects of physiology: nutrition, feeding, and digestion; salt and water regulation, and nitrogen excretion; respiration; neuromuscular physiology; and reproduction.

*R. I. Smith, V. H. Jacobsen, Edward J. DeVillez, Grover C. Stephens, R. Phillips Dales, R. B. Clark, Larry*

*C. Oglesby, Stephen H. Bishop, Clyde Manwell, Charlotte P. Mangum, M. S. Laverack, Lawrence Goldman, M. Durchon, and Joan R. Marsden.*

**The Biology of Symbiosis (28–29 Dec.)**

Arranged by Sidney J. Townsley and Thomas C. Cheng.

The symposium will serve to bring together investigators interested in several aspects of several categories of symbiosis, especially commensalism, parasitism, and mutualism. Recent work indicates that some or all of the types of symbiotic relationships share a number of common features, for example, attraction to the host, metabolic exchanges between the host and symbiont; hence the interchange of ideas appears to be most appropriate at this time.

The emphasis is being placed on the "model concept" rather than relations of immediate practical importance, although some of the papers obviously serve both goals. This emphasis is being brought into focus as the result of a recent upsurge of interest in employing symbiotic organisms and relationships as models in investigating the dynamic aspects at all levels of organization.

*Thomas C. Cheng, Austin J. MacInnis, William C. Stewart, M. A. Stirewalt, George S. Losey, Ronald V. Dimock, Sidney Townsley, Charles F. Lytle, Leonard G. Epp, G. T. Barthamus, David R. Lincicome, Winona B. Vernberg, F. John Vernberg, Siro Kawaguti, Kiyoshi Yamazato, Marenes R. Tripp, Herbert W. F. Yee, and Richard N. Mariscal.*

**Aspects of Lower Tetrapod Evolution (28–29 Dec.)**

Arranged by Keith S. Thomson and Thomas S. Parsons.

The symposium will bring together workers on varying aspects of lower tetrapod morphology, including paleontologiocal, phylogenetic, functional, and ecological studies. There is no focusing on one problem. It is especially appropriate to honor Professor Alfred Sherwood Romer on the occasion of his seventy-fifth birthday with such a wide array of papers, many of them by his former students and associates, since he has worked on and contributed to our knowledge and understanding of so many of the different areas considered. The symposium also marks the tenth anniversary of the founding of the Division of Vertebrate Morphology of the American Society of Zoologists which Professor Romer helped to organize.

*Thomas S. Parsons, Keith S. Thomson, Kathleen H. Bossy, David B. Wake, Carl Gans, Bryan Patterson, Everett C. Olson, Peter P. Vaughn, Richard D. Estes, James M. Moulton, Robert L. Carroll, Donald Baird, Paul F. A. Maderson, Thomas H. Frazzetta, and Pieter Dullemeijer.*

**The Stream Ecosystem (29 Dec.)**

Arranged by Kenneth W. Cummins.

In recent years, a large segment of concern over our severe environmental crisis has centered on running water habitats. The formulation of suitable management practices for streams has been greatly hampered by the lack of fundamental data on the functioning of lotic systems. Since it is nonpolluted streams that man wishes to maintain or reinstate, the data required necessarily involve complex communities typical of "healthy" streams. North American ecologists have begun to provide such basic data essential for the intelligent preservation, manipulation, and rehabilitation of our continental streams. The symposium stresses the state of our knowledge of stream community composition and structure together with functional aspects such as biomass production, energy transfer, and the role of terrestrially produced organic matter. The intent is to summarize current concepts.

*Kenneth W. Cummins, G. Wayne Minshall, Rudolph N. Thut, Jerry Wilm, Daniel J. Nelson, Roland L. Seymour, Andrew L. Hamilton, Thomas F. Waters, Charles E. Warren, and Ruth Patrick.*

**Hormonal Controls in Gonadal Function (29 Dec.)**

Arranged by D. W. Bishop and Hans Laufer.

*Emil Steinberger, David W. Bishop, Allen W. Schuetz, Irvine R. Hagadorn, Carroll M. Williams, Michael P. Kambysellis, Edward M. Donaldson, Roy O. Greep, Jean-Guy Lehoux, Gordon H. Sato, Cornelia P. Channing, and Kristen B. Eik-Nes.*

**Integrated Control of Disease Vectors (29 Dec.)**

Arranged by Norman D. Levine.

Integrated control of disease vectors is the coordinated control of these organisms using all known biological, chemical, physical, and other means. In the past, attempts at controlling disease vectors have centered around chemical means, such as the use of DDT for mosquitoes and of copper sulfate for the snail vectors of blood flukes. However, the danger of environmental pollution with such chemicals and of their concentration in the food chain has led investigators to turn more to other methods of vector control.

Habitat and food elimination, parasite and predator, utilization, radiologic attack, and other measures are being studied more intensively, but the use of biodegradable pesticides is not being forgotten.

*Norman D. Levine, John D. Briggs, Marshall Laird, John P. Kramer, William R. Jobin, and Robert L. Metcalf.*

**Biochemical Adaptation (29–30 Dec.)**

Arranged by Frank P. Conte.

The symposium will deal with the molecular and metabolic aspects of adaptation in animals. The discovery of multiple forms of macromolecules, such as enzymes and nucleic acids, having similar structural and identical functional characteristics and their widespread occurrence in nature has provided several model systems for the study of the biochemical basis of physiological adaptation. The important work by Brown and Campbell on the evolution and adaptation of the enzymatic pathways of nitrogen metabolism in various animals has led us to an understanding of the basic biochemical mechanism by which an organism can adapt from an aquatic to a terrestrial environment. Similarly, Brosemer and Wilson's experimentation with dehydrogenases has shown the uniqueness of this enzyme system in the development of

muscle for the function of flight. Recent work by Hochachka, Haschemeyer, and DeVries has given us new insight into the role of proteins in temperature adaptation of higher organisms. In addition, the important and unique role of the protein biosynthetic apparatus in adaptation to salinity by halophilic organisms will be presented by Bayley and Conte.

*Frank P. Conte, Allan Wilson, George W. Brown, Jr., James W. Campbell, Ronald W. Brosemer, Peter Hochachka, Arthur DeVries, Audrey E. V. Haschemeyer, and S. T. Bayley.*

**Ecology and the Undergraduate Curriculum (30 Dec.)**
Arranged by Rezneat M. Darnell and George W. Cox.

The classical field of ecology has often been identified as an aggregation of natural history miscellanea which might provide some enrichment for the liberal arts student, but which would be of only limited value in the curriculum of the serious biology major. In point of fact, modern ecology has become a sophisticated discipline with firm experimental and mathematical base. In subject and in methodology it should be pertinent in the training of the molecular biologist or the medical doctor. Its scope includes a focus upon man and his environmental relations so that is is of value well beyond the immediate biology curriculum.

These facts, well recognized by the body of professional ecologists, are often not fully appreciated by non-ecologists. It is the purpose of the present symposium to make the case for modern ecology in clear terms and to explore the implementation of ecology courses in the undergraduate curriculum. This matter should receive serious consideration by every college and university which is concerned that its students, regardless of professional goals, receive training to cope with the problems of the modern world.

*Rezneat M. Darnell, Edward J. Kormondy, George W. Cox, and Richard V. Bovbjerg.*

**The Sea-Level Panama Canal: Marine Biological Effects (30 Dec.)**
Arranged by John C. Briggs.

Recently there has been much controversy about the possible effects of the construction of a sea-level canal on the marine fauna that exists on each side of the Isthmus of Panama. Since the present canal is a freshwater passage, the marine faunas have remained distinct. What would be the result of a faunal mixing via a saltwater canal?

*John C. Briggs, H. B. Fell, N. A. Powell, K. J. Boss, R. W. Topp, H. J. Humm, G. L. Voss, and J. P. Sheffey.*

## Biological Sciences (FG)

**Presidential Address (American Society of Naturalists) (28 Dec.)**
Speaker: G. Ledyard Stebbins.

*The Natural History and Evolutionary Future of Mankind* (28 Dec.)

The human species is examined as many naturalists look at evolving animal species, in terms of four questions and their answers: (i) Where does the species occur? Answer, everywhere. (ii) Why does it occupy this niche? Because it can modify the external environment to suit its needs. (iii) When did it occupy this niche? Between 50,000 years ago and the present. (iv) How? By toolmaking, social organization, and planning. His future depends upon the degree to which he can conquer his two inherent weaknesses: his much greater ability to deal with the world about him than with his own social organization, and his astounding ability for deceiving himself and for pursuing superficially attractive but ultimately disastrous "solutions."

Two prime prerequisites are suggested for ultimate success: (i) Insurance that the templates for cultural organization will survive any disasters that may in the near future overcome a large segment of our species, and (ii) development of a synthetic approach to the correction of the various evils that have been brought on by the too rapid development of a technological superstructure of organization. The belief is expressed that such corrective measures as population control, increase in food supply, environmental control, reduction of class difference, and equalization of economic opportunity are not competitive but complementary to each other.

**Newer Trends in Population Biology (28 Dec.)**
Arranged by Robert H. MacArthur.

Separate researches on intertidal ecology, limiting factors in seasonal environments, island colonization, and New Guinea ecology will be presented.

*William Bossert, Steven Fretwell, Jared Diamond, Robert Paine, and Dan Simberloff.*

**Using Ecological Data for Environmental Decision (28 Dec.)**
Arranged by Charles F. Cooper.

The major decisions about the quality of man's environment in a technological society are ultimately made through the political process. Engineers, regional planners and those in related professions are primarily responsible for carrying out those decisions. Ecologists must provide much of the information used in basing sound decisions and in developing effective methods of carrying them out. This session will consider several closely related questions: What kind of ecological data are required by those concerned with decisions about environmental quality; how can the professional ecologists provide the needed data; and how can ecological information be effectively channeled into the decision-making processes?

*Charles F. Cooper, Richard A. Carpenter, Bostwick H. Ketchum, Daniel H. Carson, Frank Gregg, and Joseph A. Mihursky.*

**Inshore Mollusks: Species Under Stress (30 Dec.)**
Arranged by Perry Jeffries.

*Perry Jeffries, Carl N. Shuster, Robert W. Hanks, William H. Gilbert, Anthony Calabrese, Carl Sinderman, Paul Yevich, and Ronald Eisler.*

### The Theory and Practice of Biological Control (30–31 Dec.)

Arranged by Carl B. Huffaker.

The explosive increase in the world's human population, with consequent need to feed an ever-increasing number of hungry mouths, and the concomitant, and largely resultant, pollution of the environment in which man must live and produce the things he needs, are forcing him to search for means of solving the first problem without intensifying the latter. Three formidable problems involve; (i) the disturbance of the natural enemies that often serve to control many pest species in agricultural ecosystems if not severely disturbed by use of chemicals; (ii) the development of resistance to the chemicals used against them on the part of the pest species; and (iii) increasing pollution of the environment attendant with perpetuating programs of adding more and more chemicals to the environment.

If we are to reverse the trend toward an ever-intensified overloading of the environment with polluting pesticides, we must show that biological control, combined with restricted usage of selective chemicals and other measures, can solve many of our pest problems without resort to excessive use of such chemicals.

This symposium seeks to examine these concepts, premises, and practices and to present before the scientific world and the lay public an exposé of the potentialities for a much wider employment of biological control agents (parasites, predators, and pathogens) as a means of alleviating the pesticide contribution to the problem of environmental pollution.

*Carl B. Huffaker, R. L. Doutt, Ray F. Smith, P. S. Messenger, Paul DeBach, Robert Van Den Bosch, George C. Varley, G. R. Gradwell, Reece Sailer, Lloyd Andres, R. D. Goeden, David Rosen, C. E. Kennett, N. W. Hussey, L. Bravenboer, D. G. Embree, M. F. Schuster, David Pimentel, K. S. Hagen, D. L. Dahlsten, Robert L. Rabb, A. W. MacPhee, F. T. Lord, Philip Corbett, R. W. Stark, L. A. Falcon, F. D. Parker, T. F. Leigh, V. M. Stern, D. Gonzales, S. C. Hoyt, L. E. Caltagirone, Brian Wood, and Isaac Harpaz.*

### Presidential Address (Society for the Study of Evolution) (30 Dec.)

Speaker: Herbert G. Baker.

*Evolution in the Tropics.*

## Botanical Sciences (G)

### Photosynthetic Organisms: Orgin and Evolution on Early Earth (26 Dec.)

Arranged by Lynn Margulis.

Recent studies of ancient sedimentary rocks in South Africa, North America, and Australia provide evidence for the presence of cellular life on the planet dating from at least twenty-seven hundred million years ago and perhaps as long ago as thirty-four hundred million years. Microscopic sections of cherts, organic geochemical studies, and field observations, especially of algal stromatolites, together support an extremely early history for microbial photosynthesizers. We hope to develop a plausible evolutionary sequence from anaerobic bacterial photosynthesizers through green plants consistent with both the new geological evidence and current work on cellular structure and biochemistry.

*Lynn Margulis, Cyril Ponnamperuma, Bartholomew Nagy, Preston Cloud, Jr., Paul Hoffman, and Norman I. Krinsky.*

### Cell Division (30 Dec.)

Arranged by John G. Torrey.

The dynamic process of cell division continues to be the subject of intensive research in both plant and animal systems. In recent years, much interest has centered on the mitotic apparatus and its component structures, especially in relation to elements involved in the organization, replication and separation of the genetic material of the cell. It is the purpose of this symposium to examine recent ideas concerning the biochemical bases for mitosis, the structure and function of microtubules in the cell division process, and the implications of cell division for subsequent cellular events. A model for mitosis will be developed, especially in relation to the role of microtubules. Information from both plant and animal systems will be drawn upon in these presentations, including an assessment of the evidence for an obligate relation between cell division and cytodifferentiation.

*William A. Jensen, Peter K. Hepler, J. Richard Mc-*

Plant mitosis. [A. Bajer, University of Oregon, and P. D. Allen, Princeton University]

*Intosh, Jack Van't Hof, John G. Torrey, and Donald E. Fosket.*

**Organization and Developments of Plants (30 Dec.)**
Arranged by A. E. DeMaggio.

The development of a plant from a unicellular egg into an integrated, multicellular organism proceeds by a series of complex and interrelated events. Certain of these events have been described for many plants and much attention has been given to anatomical and morphological details. However, we know very little about the external and internal regulatory mechanisms and the manner by which they influence developmental processes. An understanding of these processes is essential not only for the knowledgeable utilization and replacement of our plant resources but also for the continued improvement of our agricultural practices. The application of newer techniques of biochemistry, cytology, and physiology to studies of plant organization and development provides an opportunity for fruitful examination of causal mechanisms. This symposium focuses on recent investigations of the molecular, cellular and subcellular activities taking place during development and illustrates the direction of much current research.

*A. E. DeMaggio, J. Mascarenhas, P. Green, J. Rier, M. E. Clutter, and I. M. Sussex.*

## Anthropology (H)

**Field Studies of Nutrition and Behavior (27 Dec.)**
Arranged by Andrew P. Vayda.

Much behavior related to nutrition does not make sense unless seen in relation to the ecological setting in which it takes place. This symposium deals with the ecological setting of behavior related to nutrition in primitive, peasant, and developing societies around the world.

*Andrew P. Vayda, Richard B. Lee, Robert K. Dentan, Mark D. Dornstreich, Georgeda Buchbinder, Donald E. Vermeer, V. R. Dyson-Hudson, Neville Dyson-Hudson, Arlene Fonaroff, L. Schuyler Fonaroff, John R. K. Robson, Daniel R. Gross, Barbara A. Underwood, and Herbert G. Birch.*

**The City as a Social System: Perspectives on Urban Social Problems (28 Dec.)**
Arranged by Helen I. Safa.

The purpose of this symposium is to bring together a group of social scientists and planners who have dealt directly with urban problems to work toward a comprehensive and operational view of the city. Most work in urban areas has concentrated on one urban neighborhood, usually a slum or shantytown, or on a single urban institution such as schools, political parties, hospitals, etc. There is a great need to see how these neighborhoods and institutions interrelate within the city as a whole, but we have not yet developed the appropriate analytical tools or methodologies to deal with this larger framework. Hence our theories have failed to keep pace with the growing complexity of urban problems, many of which demand solutions on a regional or nationwide scale. In fact, we may question whether the city itself is the appropriate unit of analysis or whether we should not look beyond the city towards metropolitan or regional frame of reference. By bringing together specialists in such diverse fields as anthropology, sociology, geography, political science, psychology, and urban planning, we hope to share the viewpoint of a variety of disciplines on this problem.

*Helen I. Safa, Badi Foster, Lisa Peattie, Howard Stanton, R. S. Bryce-Laporte, Anthony Leeds, John F. C. Turner, George Carey, Marc Fried, Aidan Southall, and Suzanne Keller.*

**Land Use, Population, and Settlement in Ancient Mexico and Guatemala (28 Dec.)**
Arranged by Pedro Armillas.

A number of recent and current programs for archeological researches in central and southern Mexico, and in the Guatemalan Highlands and the tropical lowlands of the Peten, have been oriented to the study of pre-Columbian field systems and settlement patterns. The common procedure for these investigations has been to concentrate on well-delimited and not too large areas—varying in extension from less than 100 to a few hundred square kilometers. The participants have applied this general approach, and a variety of methods adjusted to different situations, to test areas in different environmental settings, with the common aim of establishing firm bases for the study of retrospective demography and its bearings on cultural ecology and the processes of civilization within these ancient hearths of aboriginal high culture in the New World. The reports on their method and the results will be presented during this symposium.

*Gordon R. Willey, Richard B. Woodbury, William T. Sanders, Jeffrey R. Parsons, Richard E. Blanton, Pedro Armillas, Edward E. Calnek, Kent V. Flannery, Joseph W. Michels, Dennis E. Puleston, and Pedro Carrasco.*

**Sectoral Clashes and Development Policy (29 Dec.)**
Arranged by Markos Mamalakis.

The symposium will have the general purpose of presenting and integrating current work on the impact of sectoral clashes on the development process and policies. Recent research in a variety of Latin American countries suggests that economic sectors, such as agriculture, industry, and services, have influenced and have been affected in their growth patterns by government policies. Evidence indicates that economic sectors have been a source of power and a source of common interest. The recent theory of sectoral clashes by Markos Mamalakis hypothesizes that in the process of development participation to a sector creates often a stronger bond for persons than participation to a class. The Marxist phenomenon of class struggle is thus likely to be far less evident or important than the phenomena of sectoral struggle and coalitions.

*Richard Schaedel, Markos Mamalakis, William P. McGreevey, Robert Dix, George Dominguez, John Powell, Luciano Barraza, Gerassimos Arsenius, Miguel Wionczek, Manuel Gottlieb, Davie Chaplin, Bo Anderson, James Malloy, Myron Frankman, Shane Hunt, and Anthony Leeds.*

### International Study of Eskimos (30 Dec.)

Arranged by David R. Hughes.

The International Biological Programme (IBP) includes a section aimed at the worldwide comparative study of human adaptability. The IBP as a whole is concerned essentially with the functional relation of living things to their environments, in the sea, in fresh water, and on the land; it is conceived as the worldwide ecological study of communities of plants and animals—those still existing in relatively natural habitats and those in more disturbed or artificial conditions.

An analogous approach can be made to the ecology of mankind. The enormous advances in technology make it certain that many communities which have been changing slowly or not at all will relatively soon be totally transformed. We are therefore in a period when the biology of the human race is undergoing continuous change measured in terms of health, fitness and genetic constitution.

This portion of the IBP Human Adaptability Section is concerned with Eskimo Communities in Alaska, Canada, and Greenland.

*David R. Hughes, Frederick A. Milan, Frank Pauls, Wayne Thompson, Ronald Laessig, Albert A. Dahlberg, M. Matsumoto, Donald Rennie, Robert W. Fitts, Peter Diprampero, Lynn Sinclair, Daniel Robinhold, David Rice, Paul L. Jamison, Joseph G. Bohlen, Carol Feldman, R. Darrell Bock, Anthony B. Way, Richard B. Mazess, J. B. Jørgensen, R. Gessain, J. A. Hildes, O. Schaefer, John T. Mayhall, Joan DePena, Heather Milne, and Roy J. Shephard.*

## Psychology (I)

### Vice Presidential Address (29 Dec.)

Speaker: Wendell R. Garner.

*Some Experiments on Temporal Pattern Perception.*

Simple temporal patterns can be generated by using dichotomous stimulus elements (usually auditory) to form sequences of different length, which are then repeated continuously without pause. There are as many possible perceptual organizations of such patterns as there are elements in the sequence, but not all of them are used by observers. With such patterns, the difficulty with which pattern is perceived is greater when there is a large number of alternative perceptual organizations. The organizations themselves maintain runs of identical elements intact, but the organizational principles also show clear gestalt-type phenomena. For example, if a given pattern is easily perceived, so is the pattern which is its temporal reversal, a result which suggests that the perception is wholistic, reflecting relations between all elements in the pattern. In addition, however, figure-ground relations influence the perceived pattern, with the two dichotomous elements forming the possible figure and ground. Each element forms its own temporal pattern, and under some conditions one element will form a better pattern, in the gestalt sense, than the other. If stimulus conditions influence listeners to perceive these better elements as figure, then the pattern is easier than if they perceive the other elements as figure, since in this latter case the figure is poorer than the ground. Experimental data and demonstrations of these phenomena will be presented.

### Youth: Ego Ideals and the Impact of Culture (27 Dec.)

Arranged by Herman M. Serota.

Recent studies show that the Ego Ideal as a psychic substructure, which functions in conjunction with other mental structures as a guide to aspirations and behavior has two roots. One, is the capacity for Ego-Ideal formation. The other, the experiential, conveys the impact of culture on the process of Ego-Ideal formation.

One presentation will examine the vicissitudes of Ego-Ideal formation in Adolescence, and, the effects on the individual and his generation when cultural factors such as education widen the gap between Ideals and Reality. The second presentation will examine the influence of a new cultural factor, drugs, on Ego Ideals and Values in adolescence.

*Samuel Ritvo, Aaron H. Esman, Charlotte H. Babcock, Gabriel E. Casuso, Seymour L. Lustman, and Jeanne M. Spurlock.*

### Tektite: A Behavioral Study in a Hostile Environment (27 Dec.)

Arranged by Stanley Deutsch.

This symposium will bring together scientific and engineering investigators who played key roles in the recently completed Tektite I Study. This research program consisted of observations and measurements of the behavior, psychophysiological indices, performance, group dynamics, and biomedical factors of four marine scientists engaged in geological and ecological studies 50 feet under the sea. The four scientists operated in a nitrogen-saturated condition for 60 days without returning to the surface of the sea. They lived in a submerged habitat designed specially to permit scientific observation of the crew psychologically, physiologically, and medically on a continuous basis. The habitat also provided the marine scientists with continuous access to the ocean bottom. By the use of ingenious data-gathering techniques, the most comprehensive series of measurements and observations were made. The study, methodology, and results will be presented in detail. Future research strategies will be discussed.

*Stanley Deutsch, John B. Tenney, Richard Mach, Roland W. Radloff, Nicholas Zill, Suzanne Kronheim, Theodore Marton, and Richard A. Waller.*

### Education of the Infant and Young Child: Empirical Data and Theoretical Issues (28 Dec.)

Arranged by Victor H. Denenberg.

One of the trends in "early education" is to shift the start of formal education to even earlier ages. At the present time there are a number of programs, including day-care centers, where very young children are exposed to a variety of educational experiences. If one projects this trend, it is likely that there will soon be day-care centers around the country which will be aimed at the very young child (6 months old) and particularly that segment of the

population which is often called "culturally deprived." One question of great concern is: What experiences should these infants receive in the day-care centers? We have much information from many diverse fields showing that experiences in very early life have long lasting and powerful impacts upon developing organisms, including the human. Thus, the manipulation of experiences (educational, social, emotional) in a day-care center offers the potential for great good or great harm. The purpose of this symposium is to summarize data which are available at both the human and the subhuman level, to discuss theoretical issues involved in this topic, and to make suggestions concerning further research in the area.

*Victor H. Denenberg, Jerome Kagan, William A. Mason, Hanus Papousek, Earl S. Schaefer, David P. Weikart, Jerome S. Bruner, and Richard Orton.*

**Speech Synthesis and Perception (28 Dec.)**

Arranged by James Curtis.

The purpose of this session is to describe the state of the art of research in the area of speech perception. The topics covered will include: perceptual research related to linguistic and phonetic units; underwater speech perception; voice identification; laterality effects in the perception of speech; and the use of speech synthesis in perception studies.

The papers will consider both the theoretical aspects of such research and the potential application for communication systems.

*James Curtis, Donald Shankweiler, Harry Hollien, Dennis H. Klatt, Peter B. Denes, and James M. Pickett.*

**Malnutrition and Learning in Children within the United States (29 Dec.)**

Arranged by Bernard Brown.

The purpose of this symposium is to explore the extent to which biological environment, including food, adds to and interacts with social and familial environment in contributing to learning disabilities in children. Investigators of severe malnutrition in laboratory animals as well as in Central American and African children have found that severe malnutrition produces growth retardation in brain and body with accompanying deficits in learning ability and in learned behavior.

Recent studies have specifically considered the effects of relatively mild malnutrition on children in the United States. Behavior measurements have been correlated with measurements of nutritional deficits found in children in Louisiana. Individuals and groups at risk as a result of nutritional stress have been identified in studies of anatomical, physiological, psychological, and sociological factors. These factors include family size, birth weight, height, and sex. Environmental factors such as temperature can combine with malnutrition to produce learning disabilities. Prenatal malnutrition has been found to retard fetal growth; the associated factors in prenatal malnutrition are probable indicators of the various effects of postnatal malnutrition. The characteristics of malnourished populations show a striking resemblance to some of the known characteristics of the disadvantaged.

A central issue which will be considered involved the causal significance of the types of malnutrition found in the United States in the development of learning disabilities. A related issue concerns the relative significance of heredity as opposed to environment.

*Edith H. Grotberg, John A. Churchill, Bernard Brown, Jefferson A. Sulzer, Herbert G. Birch, and A. Frederick North.*

**Pattern Perception (29–30 Dec.)**

Arranged by Paul C. Vitz.

The symposium will bring together current work on the perception of visual or spatial pattern and on the perception of temporal pattern. Both physiological and behavioral studies will be represented and one emphasis will be on relating these two kinds of evidence.

An additional emphasis will be on new studies of infant and adult response to a variety of geometric forms. These studies are addressed to the issues of how human pattern perception develops and to the sequential processing of the parts of a pattern which apparently precedes the human's precept of the whole figure.

Work on the important problem of temporal pattern perception—for example, the perception of rhythm—will also be presented.

A third major concern will be on theoretical interpretations of pattern perception. The various requirements of an adequate theory of pattern perception will serve as a general theme.

*Paul C. Vitz, Leo Ganz, Peter H. Schiller, Philip H. Salapatik, N. S. Sutherland, Joseph H. McFarland, Stephen Handel, and Ralph N. Haber.*

**Sensory-Specific Information in Human Memory (30 Dec.)**

Arranged by Robert G. Crowder.

The theoretical analysis of human memory has been greatly stimulated (but also greatly complicated) recently by evidence that there are appreciable differences in the short-term retention of auditory and visual information. Specifically, immediate memory for short lists of verbal items is now known to depend on whether or not the list entered through the peripheral, auditory system. The importance of such peripheral influences on human information processing is that they are anomalous from the context of traditional theory insofar as they deny a uniform abstract code for verbal memory. Among the empirical issues to be addressed are the magnitude and generality of modality effects across tasks, individuals, and types of materials. The urgent theoretical questions have to do with the relation between sensory-specific storage and more general models of human memory. How distinct, for example, are the peripheral subsystems from one another and from other types of storage? What rules govern the registration, storage, and retrieval of information from peripheral subsystems? Are these rules different in type or in degree from those rules established for other types of memory?

*Robert G. Crowder, David J. Murray, Fergus I. M. Craik, and Bennett B. Murdock, Jr.*

**Effects of Nutrition on Behavior: Studies in Animal and Man (30 Dec.)**
Arranged by Judy Rosenblith.

The effects of nutrition on behavior, as opposed to those on growth and health per se, are not very well documented. They are of great interest in view of the many areas of the world where malnutrition prevails and in view of the fact that many people are not adequately nourished in our own society. Behavioral effects of malnutrition which do not show remission when adequate diet is achieved are of particular concern. These are thought to occur chiefly when the organism is malnourished in the period when there is still rapid growth of the central nervous system. The exact timing of this varies from species to species. Our symposium will concentrate on children or young organisms. Data on the effects of different kinds of malnutrition, the effects on different species, and the effects on human children in different countries will be presented and discussed. The difficulties of doing scientifically adequate work in this area will also be stressed.

*Judy F. Rosenblith, Henry N. Ricciuti, Robert E. Klein, David A. Levitsky, Harrison McKay, Arlene McKay, Joseph J. Vitale, Harry F. Harlow, Margaret K. Harlow, and Herbert G. Birch.*

## Social and Economic Sciences (K)

**Vice Presidential Address (28 Dec.)**
Speakers: Sheldon and Eleanor Glueck.

*White Delinquents in the City Slums: As Boys and Men*

**Mathematical Modeling in the Social Sciences (26 Dec.)**
Arranged by Samuel J. Bernstein.

The use of mathematical models in social science research concerns the formulation of a specific model for the analysis of a particular economic, social, or political phenomenon. The material is presented in a format which shows how the model is formulated, how it functions, and what derivations may be made from it which will increase the comprehension of the phenomenon under scrutiny.

*Samuel J. Bernstein, Ralph B. Ginsburg, Mancur L. Olson, William H. Riker, Steven J. Brams, Bernhardt Leiberman, Martin Pfaff, and Gerald H. Kramer.*

**The Grants Economy (26–27 Dec.)**
Arranged by Janos Horvath.

The grants economy is becoming a sizable part of all modern economic systems and is an essential instrument in the study of the integrative system. Its theory is an essential complement to the theory of exchange. It does involve expanding the underlying psychology of economics beyond such concepts as the Paretian optimum, to include concepts of interrelatedness of utility functions through benevolence or malevolence and to include certain elements of what is being called the "integrative system," such as the status and identity of individuals and the communities with which they identify. The international and comparative study of the grants economy is an important element of the problem.

These sessions are to study theoretical aspects, especially measuring techniques, of unilateral transfers; and to offer empirical examinations regarding motivations and attainments of various types of unilateral transfers.

*Martin Pfaff, Robert A. Solo, George Daly, Fred Giertz, David B. Johnson, Harold M. Hochman, James Rogers, Gordon Tullock, William F. Hellmuth, Gabriel Rudney, Benjamin A. Okner, Henry Aaron, Thomas Muller, Patricia A. Burke, John R. Burke, Andrew M. Kamarck, Howard Hilton, Hossian Ahmadie, Samuel J. Bernstein, Paul Jonas, J. Arsenis, Kenneth E. Boulding, Christopher Green, Alfred Tella, David Elesh, David G. Tuerck, Daniel R. Fusfeld, James Horvath, and Irving Leverson.*

**Differential Fertility and Family Planning (27 Dec.)**
Arranged by Edward G. Stockwell.

The focus will be on differential fertility, both national (U.S.) and international. Attention will be directed toward factors underlying present differentials in so far as such factors may be relevant for an eventual reduction of high levels of fertility and a consequent narrowing of existing differentials. Special consideration will be given to the present status and future prospects of the various family programs throughout the world.

*Edward G. Stockwell, David M. Heer, Robert H. Weller, John J. Macisco, Jr., W. Parker Mauldin, Leon F. Bouvier, Jr., and David W. Yaukey.*

**Methodology in the Sociology of Religion (28 Dec.)**
Arranged by Robert J. McNamara.

Under just what formalities religion and religious believers can be subjected to rigorous sociological analysis has long been debated by sociologists and the believers whom sociologists study. Today virtually everyone agrees that religion, in its institutional and behavioral aspects, is a legitimate focus for sociological study. But serious discussion continues about the ways in which sociology can most fruitfully study religion. What methods should it employ? What philosophies of method govern the selection of one or another method at a given point in time? What has sociology added to our knowledge of religion and religious behavior? What *could* it add? These are the questions with which this session will grapple.

*Robert J. McNarmara, Richard L. Means, Jeffrey K. Hadden, and Stephen L. Finner.*

**Sociology of Science: Social Implications of Organ Transplantation (30 Dec.)**
Arranged by Renée C. Fox.

Organ transplantation is among the most recent and important experimental developments in clinical medicine. It has evoked a more than ordinary amount of professional and popular interest and concern. A sociological perspective suggests that the degree and kind of attention organ transplantation has attracted is chiefly a consequence of two sets of factors. In a dramatic, somewhat magnified form, it presents virtually the whole range of medical,

ethical, legal, social, cultural, and psychological problems that classically accompany therapeutic innovation and medical experimentation with human subjects. Organ transplantation has also given rise to a more unique set of phenomena, associated with certain values, beliefs, and attitudes that have basic symbolic or sacred meaning in modern society. The panel of participants will approach organ transplantation as a paradigmatic case, whose social implications are applicable to other present-day and future biomedical advances.

*George P. Baker, Jr., Alfred M. Sadler, Jr., Blair L. Sadler, Francis D. Moore, and Judith P. Swazey.*

**Approaches to Policy Sciences (28 Dec.)**

Arranged by Yehezkel Dror.

Policy sciences are a new interdiscipline, focusing on the study and improvement of policymaking. Based on a fusion between behavioral sciences and analytical approaches, policy sciences rely also on decision theory, general systems theory, management sciences, conflict theory, strategic analysis, and systems engineering.

Policy sciences are very demanding on scholars, practitioners, and students alike. Policy sciences do not lead to a complete transformation in policymaking; but politicians and senior executives have to change some of their patterns of thinking and decision-making to avail themselves of the contributions of policy sciences. The emergence of policy sciences had also fargoing implications for the scientific community and its social role, especially in providing better frames-of-appreciation and channels for increasing and improving the contributions of systematic knowledge and structured rationality to human affairs.

*Harold D. Lasswell, Yehezkel Dror, Herman Kahn, Timothy Costello, Douglas Bunker, John Thomas, Davis B. Bobrow, Henry S. Rowen, Melvin Webber, Erich Jantsch, and William Gorham.*

**The Political Attitudes of Scientists (29 Dec.)**

Arranged by Harvey M. Sapolsky.

The important role that scientists have played in the formation of public policy and the recognition that policy issues contain value as well as factual components have led to a growing interest in the political attitudes of scientists. This interest is heightened as scientists in the various countries have sought to promote international peace and domestic social reform through activities both within and outside the scientific community. Recent studies have examined the attitudes on political issues of scientists in various disciplines, institutional settings, and career stages. Relating these studies to empirical work previously done in the sociology of science, international relations, and political science is one intent of this session. Placing them in broader theoretical and historical context is another intent.

*Harvey M. Sapolsky, David Nichols, Albert Teich, Yaron Ezrahi, Eugene Rabinowitch, Bernice Eiduson, and Jean-Jacques Salomon.*

**Science and Public Policy Workshop: Technology Assessment (29 Dec.)**

Arranged by Harvey M. Sapolsky.

The government's role in determining the direction of technological advances through its support of research, development, and innovative activities is obviously large. The government's potential power to regulate the introduction of all technological advances in the interest of the public is clear. A growing concern with the negative environmental and societal consequences of technological change has stimulated attempts to describe mechanisms for technological assessment which will allow more intelligent promotion and control of technology by government in the public interest. Recently, the National Academy of Sciences, the National Academy of Engineering, and the Library of Congress have issued reports on technological assessment, the past experience and the future prospects. A panel of the Science and Public Policy Studies Group will assess the technology assessment reports.

*Raymond Bowers, Eugene S. Uyeki, Hugh Folk, and John W. Reuss.*

**The Organization of Urban Places (29–30 Dec.)**

Arranged by Leonard J. Fein.

An older literature urging metropolitanization of urban regions has been joined, if not replaced, by a new literature urging decentralization of urban areas. In addition, new interest has been expressed in the relationship of urban size to the sense of community of urban residents. The purpose of the symposium is to examine the issues here suggested, and, in particular, to explore the nature of their interrelations. Is it, for example, possible that both metropolitanization and decentralization can take place simultaneously, if only we can be more precise about what the functions to be dealt with are, or is there a necessary trade-off between them? What are the most compelling economies of scale involved in the management of urban areas, and what are the most powerful supports of the sense of community?

*Leonard J. Fein, Alan Altshuler, Herbert Gans, Milton Kotler, David Cohen, Gar Alperovitz, Barney Frank, Alan Sloan, Michael Lipsky, Murray Edelman, David Olson, and Anthony Platt.*

**Science and Society: A New Intergovernmental Approach to Domestic Problems (30 Dec.)**

Arranged by M. Frank Hersman, Thomas G. Fox, and Robert W. Cairns.

This symposium is intended to provide a forum for scientists and government officials to explore the character of a new partnership among government, universities, and industry to use science to serve society. On the premise that state government is strategically placed—at once close to those governed and potentially capable of working effectively with federal and local authority and with universities and industry, the emphasis is on the prospective central role of state government in the national tasks ahead—to meet the urgent needs of a growing population in an increasingly urbanized and technological society.

The morning session will be devoted to examining current patterns and future prospects for utilizing scientific expertise in state government and in developing productive state science policies. The afternoon session will examine the functions of science and technology in serving state government, as seen by state officials, and the opportuni-

ties for interaction of state government with federal agencies and the universities, as seen by leaders in federal and academic establishments.

*Robert W. Cairns, Harvey M. Sapolsky, A. B. Biscoe, Jr., Wyatt M. Rogers, Jr., Chandler H. Stevens, Thomas G. Fox, John N. Dempsey, and Detlev Bronk.*

**Communication of Science (30 Dec.).**
Arranged by Linton Freeman.

The study of scientific communication has become a major focus in the several behavioral sciences. The concern has been with the flow of information among scientists, teachers, engineers, and the general public. Such research is important in dealing with questions of the growth of systematic knowledge as well as its applicability and even its financial support. Recent work has passed beyond simple tabulation and descriptions of patterns of information exchange. Currently, models are being developed and tested. In the long run these may well lead to the engineering of more nearly optimum systems for scientific communication than those systems which are now employed.

*Linton Freeman, Manfred Kochen, Belver Griffith, and Diana Crane.*

**Inching toward the Metric System (30 Dec.)**
Arranged by John Howard.

The meeting of the Metric Association will concern two principal topics. We are at the halfway points of two major efforts: the 10-year conversion of Great Britain to the metric system, and the 3-year study by the U.S. National Bureau of Standards of pros and cons of a U.S. conversion. Status reports will be presented on each of these efforts, and a paper on Canadian progress will also be included.

The other topic for discussion will be specific problems of conversion in specific industries. Specific papers on metric conversion in education and in the fields of food, nutrition, and agriculture will be presented.

*Douglas V. Frost, A. G. McNish, J. S. Vickers, N. C. Davies, J. K. Emery, Louis F. Sokol, Faith Prior, J. F. Anderson, and W. M. Beeson.*

## History and Philosophy of Science (L)

**Sarton Memorial Lecture (27 Dec.)**
Speaker: Martin J. Klein.

*Boltzmann, Monocycles and Mechanical Explanation*

This talk will deal with the status in the late 19th century of the view that the goal of physics is "tracing the phenomena of nature back to the simple laws of mechanics." The mechanical explanation had just achieved some of its most remarkable success in the kinetic theory of gases and in James Clerk Maxwell's dynamical theory of the electromagnetic field. Hermann von Helmholtz's mechanical analogy for the second law of thermodynamics, using monocyclic systems, will serve as the focus for a discussion of the ideas of Maxwell, Heinrich Hertz, and, especially, Ludwig Boltzmann. Boltzmann viewed himself as the last defender of the flag of mechanical explanation against the attacks of Wilhelm Ostwald and the energeticists, and his scientific writings present these ideas in their most elaborate and subtle form.

**Physics and the Explanation of Life (27 Dec.)**
Arranged by Robert S. Cohen and Joseph Agassi.

*George Wald, Eugene P. Wigner, J. Bronowski, and Isaac Asimov.*

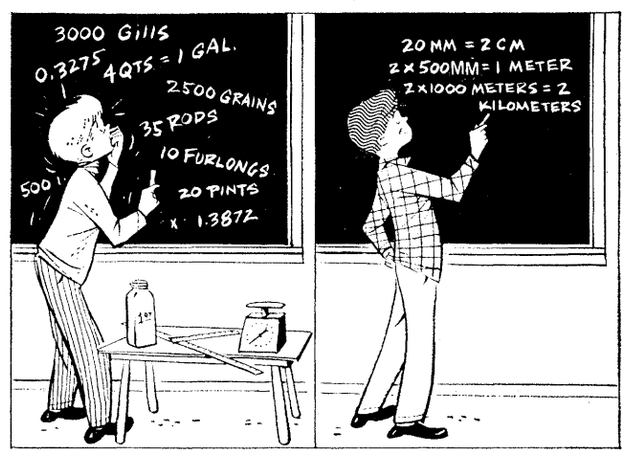
**Present Status of the Unity of Science Thesis (27 Dec.)**
Arranged by Robert S. Cohen and Herbert Feigl.

*Ernest Nagel, Peter Achinstein, Herbert Bohnert, Kenneth Schaffner, Lawrence Sklar, Gerald J. Holton, and Robert S. Cohen.*

**Extension of the Structure of Mendeleev's Periodic Table to Physical, Biological, and Social Sciences (27 Dec.)**
Arranged by Edward Haskell.

The uncoordinated centrifugal development of the sciences has undergone a revolution in recent years, making it possible to assemble them into a single discipline. Increasingly successful verifications of the hypothesis, developed between 1940 and 1948, that the structure of Mendeleev's Periodic Table is the special atomic case of the structure which all natural systems have in common, have given this revolution marked momentum. The development of cybernetics, general systems theory, and periodic geometry provide concepts and methods for its rapid spread. The physical, biological, and social sciences can now be treated as a single discipline. It has one meta-language, permits immense economy in research and education, and promises to give mankind the capability of coordinating its own and its habitat's complex developments much more successfully. The periodic coordinate system differs radically from traditional systems.

*R. Stuart Wright, Edward Haskell, Jere W. Clark, Arthur R. Jensen, and Harold G. Cassidy.*




Figuring measurements can be quite confusing. How do you convert grams to pounds? How many rods are in a furlong? Students find metric system less confusing.

[Courtesy of *Current Science*]

Self-portrait, Leonardo da Vinci [Royal Library, Turin]

**450th Anniversary of the Death of Leonardo da Vinci (28 Dec.)**
Arranged by Raymond J. Seeger.

The year 1969 is the 450th anniversary of the death of Leonardo da Vinci, one of the world's great personalities. His intellect was rarely matched in the history of civilization. He uniquely combined a genuine interest in painting, in mechanics, and in anatomy. His life epitomizes the humanistic approach to man and his environment from an interdisciplinary point of view. His contributions to physiology and medicine will be examined by Elmer Belt, a physician, whose enthusiasm for da Vinci made possible the Elmer Belt Library of Vinciana, UCLA. Da Vinci's masterpieces in painting will be reviewed by John Shapley of Howard University, and his achievements in sculpture by John Goldsmith Phillips, Western European Art Department, Metropolitan Museum of Art, New York. His insights in physical science generally, fluid mechanics particularly, will be examined by Raymond J. Seeger, secretary of Section L. His impact upon technology, including automation and architecture, will be reviewed by Bern Dibner, director of the Burndy Library in Norwalk. Raymond Stites, a psychologist, who has recently retired as assistant (for education) to the director of the National Gallery of Art in Washington, will consider da Vinci's peculiar personality in that he combined art and science, anatomy and engineering. Recent source materials will be discussed by Ladislaus Reti of UCLA.

*Raymond J. Seeger, Ladislaus Reti, Elmer Belt, John Goldsmith Phillips, John Shapley, Bern Dibner, Raymond Stites, Loren C. Eisely, and Francesco Tonciottiori.*

**Brain and Language (28 Dec.)**
Arranged by Robert S. Cohen and Stephen Toulmin.

*Marx Wartofsky, Noam Chomsky, Norman Geschwind, Eric Lenneberg, and Stephen Toulmin.*

**General Systems Education Programs for the Future (28 Dec.)**
Arranged by Jere Clark.

*Jere Clark, Bela Banathy, and Harold Rashkis.*

**Systems Aspects of Social and Environmental Problems (28–29 Dec.)**
Arranged by Lawrence B. Slobodkin.

*John Yannacone, John Batt, E. Taschdjian, David D. Martin, Charles R. Dechert, Gordon K. C. Chen, Milton D. Rubin, Robert Seder, Gordon Thompson, Frederic Firestone, Ronnal Lee, and Lawrence M. Thall.*

**Systems Models of Urban Systems (29 Dec.)**
Arranged by Britton Harris.

*Britton Harris, John W. Dyckman, Jack Ellis, Corrine L. Gilb, Yehezkel Dror, and Bertram Gross.*

**Comparative History and Sociology of Science (29 Dec.)**
Arranged by Robert S. Cohen.

*Joseph Agassi, Benjamin Schwartz, Benjamin Nelson, Stephen Toulin, Robert S. Cohen, Karl H. Niebyl, and Ernan McMullin.*

**Current Problems of Cosmology (29 Dec.)**
Arranged by John Stachel.

*John Stachel, Peter Bergmann, E. R. Harrison, Philip Morrison, David Layzer, and John Wheeler.*

**Objectivity in Anthropology (29 Dec.)**
Arranged by Robert S. Cohen and Anthony Leeds.

*John M. Roberts, Judith Agassi, Ian Jarvie, Jacob Gruber, Paul Collins, and Anthony Leeds.*

**Presidential Address, Society for General Systems Research (30 Dec.)**
Speaker: Lawrence B. Slobodkin.

*Environmental Design in Response to the Population Crisis.*

**Toward the Unification and Management and Organization (30 Dec.)**
Arranged by Edwin Tonnason.

*Edwin Tonnason, Stanley Young, Stephen Michael, and Rocco Carzo.*

## Engineering (M)

**Should a National General Engineering Society Be Established? (29 Dec.)**
Arranged by Charles F. Savage.

*Charles F. Savage, Robert H. Roy, Warren E. Alberts, William R. Marshall, and Keith K. McDaniel.*

**U. S. Manned Lunar Space Program (27–29 Dec.)**
Arranged by Paul Rosenberg.
For details, see page 1041.

## Medical Sciences (N)

**Systematic Approaches to Learning and Memory (26–27 Dec.)**
Arranged by William L. Byrne.

**Expanding Horizons in Medical Education (28 Dec.)**
Arranged by Robert M. Dowben.

The impact of contemporary technology on modern life, the rapidly expanding fund of biological knowledge, the explosive increase in population, the dwindling food supply, pollution and industrial hazards, the mobility of people, the lack of adequate medical care in underdeveloped countries and among the underprivileged in our own country, and the general demand to make the best medical care available to all have taxed our present system of medical care and created unprecedented challenges to the physician. Educational institutions are equipped to conduct the scholarly inquiry and planning required to meet the challenges which society makes upon the medical care system. By changing the goals and content of training programs, the organization of medical practice and the delivery of medical care can be altered in a sound and orderly manner. To meet the needs of the future, medical schools must address themselves to a new set of problems and train a broad range of scientific physicians. They must provide a catholic, thoughtful, provocative, sympathetic, and rigorous education for tomorrow's doctors.

*James A. Shannon, George James, David D. Rutstein, Robert M. Dowben, David E. Rogers, Robert H. Ebert, Bror Rexed, Frederick C. Robbins, Donald W. Seldin, and Thomas H. Hunter.*

**Physiological Effects of Audible Sound (Extra-Auditory) (28–30 Dec.)**
Arranged by Joseph R. Anticaglia, William F. Geber, Benson E. Ginsburg, Samuel Rosen, Annemarie S. Welch, and Bruce L. Welch.

Two days of technical sessions will provide a synthetic overview of the current state of knowledge concerning the physiological effects of noise, other than the effects upon hearing. Scientists from the United States and various foreign countries will report research on the neurological, neurochemical, cardiovascular, endocrine, reproductive, and teratogenic effects of noise, and on its effects upon sleep. Also, research that has been conducted in the course of evaluating the potential effects of the sonic boom will be reported.

One half day will be devoted to a panel discussion of the use of basic biomedical science for assessing the long-term effects of environmental change, using noise as the primary example. The symposium will conclude with overview comments by Chauncey Leake.

*Bruce L. Welch, Joseph R. Anticaglia, Samuel Rosen, Joseph P. Buckley, Gerd Jansen, William F. Geber, Harold L. Williams, J. Mendels, G. J. Thiessen, A. Arvay, I. Tamari, Lester W. Sontag, Alice G. Lehmann, Kurt Schlesinger, William Boggan, Paul Y. Sze, Benson E. Ginsburg, John L. Fuller, Kenneth R. Henry, Robert E. Bowman, Gregory B. Fink, Ben Iturrian, Francis M. Forster, L. V. Krushinsky, L. N. Molodkina, D. A. Fless, L. P. Dobrohotova, A. P. Steshenko, A. F. Semiokhina, Z. A. Zorina, L. G. Romanova, A. F. Rasmussen, Mary F. Lockett, Amilcar E. Aguelles, Henning Von Gierke, Jerome S. Lukas, Karl Kryter, James Bond, Jack M. Heinemann, Charles W. Nixon, Claude E. Forkner, Sr., William I. Gay, Peter V. Siegel, Ralph E. Hodgson, Arthur S. Miller, R. L. Collins, and Chauncey Leake.*

**Neurobiological Substrates of Behavior (29 Dec.)**
Arranged by Robert G. Grenell and Herman D. Lerner.

Noteworthy advances have occurred recently in the theory and research on electrical, chemical, and other determinants of behavior—advances that may have important implications for such fields as neurophysiology, molecular biology, biophysics, biochemistry, psychiatry, psychology, and pharmacology. In this symposium a number of developments will be summarized by key contributors to research on neurobiology and behavior. Data and models on sensory, cerebral, and integrative processes will be examined. The speakers will discuss interrelations among the various findings as well as significance for related disciplines and for public issues.

*Detlev W. Bronk, Robert G. Grenell, Eduardo G. Romero, Dominick P. Purpura, K. Krnjevic, Mary A. B. Brazier, W. Nauta, Vernon B. Mountcastle, Warren S. McCulloch, William Kilmer, and Gardner C. Quarton.*

**Impact of Current Medical Curriculum Changes on the Undergraduate College (29 Dec.)**
Arranged by Maurice L. Moore.

The symposium will have the general purpose of bringing together current information on the changes taking place in the medical school curriculum and the impact of these on the undergraduate colleges and the educational programs of the premedical students. A number of medical schools have made significant changes in their curricula and are contemplating further modifications. Other schools are evaluating these results and considering similar changes at their institutions. These changes are already having some effect in the colleges and greater impact may be anticipated for the future. Following the presentation of papers on specific phases of this subject, there will be a general discussion period for a free exchange of ideas, suggestions, and experiences among medical and premedical educators.

*Ralph G. Ascah, William F. Maloney, Alvin R. Schmidt, Lester Kieft, Perry J. Culver, and Lester S. Dewis.*

**Biology and Sociology of Violence (30 Dec.)**
Arranged by Leston L. Havens.

The purpose of the program is to provide a general review of the biology and sociology of violence aimed at delineating the present status of research topics and critical issues for future research. Biological aspects will be re-

viewed and surveyed under the topics of endocrinological, genetical, behavioral, and neurophysiological factors. The sociologists will be asked to organize their remarks under the topics of history, current research, and theory.

*Frank Ervin, Lawrence Rasavi, Arthur Kling, Donald Reis, John Spiegel, Allen D. Grimshaw, and Sheldon Levy.*

## Dentistry (Nd)

### The Interface between Bioengineering and Oral Biology (27 Dec.)

Arranged by John W. Hein.

Engineering principles and techniques have long been employed in dentistry but it is only recently that the concept of bioengineering has entered into the broader field of oral biology. Once, all efforts were concentrated on improving dental restorative materials with some minor effort on the mechanics of dental prosthesis. Now the overview has broadened to encompass the new areas of physics and technology with emphasis on the acquisition of quantitative information of the processes in oral biology. Mechanical radiation in the megahertz frequency range is being explored for application in research and diagnosis. High-energy flux applied by a laser for controlled short time intervals can change the chemical and mechanical properties of the tooth surface, potentially useful in preventive dentistry. Miniaturized electronic instrumentation is used universally in the new field of dental bioengineering. Particular advantage accrues in studying intraoral force distribution, determining the chemistry of the tooth surface and evaluating the influence of oral structures on speech defects. Advanced instrumentation and systems analysis has found application in learning how the jaw is controlled and in the design and development of a dental training device that truly simulates the human patient. The papers are representative of the increasing penetration of engineering into the field of oral biology.

*Sidney Lees, Robert Gilmore, Theodore Messerman, Charles Gibbs, Fred M. Johnson, Theodore Koulourides, Fredrick Feagin, Frank Barber, Donald F. Carter, Lawrence F. Quigley, Jr., Krishan K. Kapur, Ernest B. Kenny, Ralph H. Stern, and Ralph R. Lobene.*

## Pharmaceutical Sciences (Np)

### Vice Presidential Address (29 Dec.)

Speaker: Joseph P. Buckley.

*How Can the Pharmacist Better Interact as a Member of the Health Team?* (29 Dec.)

There has been a gradual change in the role of the pharmacist over the past 25 years, and this change is expected to continue at an accelerated pace over the next 10 years. The pharmacist's expert knowledge of drugs is now being utilized to a greater extent by physicians and other members of the allied health professions. The function of the pharmacist is gradually taking on a greater clinical appearance and, in some instances, programs have already been initiated where pharmacists are located at the patient level within the hospital and are directly involved in the selection of therapeutic agents to be used in the treatment of the patient. In this role, the pharmacist can not only increase the efficiency of the overall drug utilization program of an institution or practicing physician, but he can also improve on drug efficacy through the selection of better therapeutic agents for the particular patient, the selection of best route of administration, and the selection of best dosage form.

In order to utilize this expertise to the maximum, it is absolutely essential that the pharmacist's education enable him to communicate freely with practicing physicians, in all fields of medicine. This can be accomplished only if the practicing pharmacist's knowledge of pathology and medicine is greatly expanded. In order for the pharmacist to serve as a "true consultant," it will be necessary to initiate a compulsory continuing education program for all licensed practicing pharmacists to enable them to both develop the scientific knowledge that they may be lacking as well as to keep up with the scientific developments in medicine and therapeutics.

### Distinguished Lecture (30 Dec.)

Speaker: Lloyd C. Miller.

*How Good Are Our Drugs?*

Controversy exists over whether America's drugs are generally as good as producers of them claim and whether some are actually hazardous or relatively ineffective. An examination of the basis for the controversy leads directly to an evaluation of the adequacy of the procedure by which the drugs are developed, tested, and approved, a sequence of steps that critics say is really not a "system" at all. The apparent shortcomings, including a dichotomy of true objectives as between the producers and the Food and Drug Administration, and the curious consequences of enforced confidentiality, will be named and weighed.

The purposes and power of drug promotion will be examined in relation to drug research costs and the stress on prudence and judgment which physicians endure in prescribing medicines. The respective impacts of patents, trademarks, and profits will be dealt with in relation to the modern pharmacopeia and the sum total of drugs physicians use.

### Immuno-Suppressive Drugs for Tissue Acceptance of Natural and Synthetic Materials (30 Dec.)

Arranged by Wallace L. Guess.

*Wallace L. Guess, C. William Hall, John Ghidoni, Joseph Forkner, Anthony Monaco, Leonard B. Shulman, and Milton Hodosh.*

## Agriculture (O)

### Our Food Supply (28 Dec.)

Arranged by T. C. Byerly and Michael A. Farrell.

*D. V. Josephson, S. H. Wittwer, J. G. Horsfall, J. T. Reid, Robert S. Harris, G. N. Wogan, Willis A. Gortner, Faith Clark, Paul E. Waggoner, Eric G. Sharville, S. R. Freiberg, Herbert L. Ley, Jr., C. Glenn King, and Robert O. Herrmann.*

**Food from the Sea (29 Dec.)**
Arranged by Marie H. Berg.

With a steadily growing population the procurement of food for the world population becomes an increasingly alarming issue. Since more than 70 percent of the "Spaceship Earth" is covered by water, can this area be utilized to increase the food supply to ward off threatening famine?

It is the purpose of this symposium to consider critically the possible resources and what can be done with proper management.

*Louis F. Bush, Arthur C. Mathieson, Wilbert M. Chapman, and Robert L. Edwards.*

**Luncheon for All Women in Science (29 Dec.)**
Speaker: Hazel Fox.

*New Foods for a Hungry World.*

Meeting protein needs of expanding populations demands many approaches. The protein quality of conventional and unconventional foods has been studied in nitrogen balance tests with human adults. Identifying the amino acids limiting the usefulness of these foods is a basic for recommending suitable combinations of foods for supplying protein needs.

## Industrial Sciences (P)

**Past Vice Presidential Address (29 Dec.)**
Speaker: Donald W. Collier.

**Managing the Growth of the Small Technical Company (29 Dec.)**
Arranged by Jordan D. Lewis.

The symposium will investigate some key problems faced by the growing scientifically based company. Most small technical companies are well equipped to perform their necessary research, development, and engineering functions. All too often insufficient attention is given to the equally important marketing and management development activities. Indeed, the failure of the majority of small technically based companies can be attributed to insufficient attention being paid to the generation of market and economic information, the utilization of this information and the structuring of a marketing force, and the development of capable management personnel. This symposium will consist of presentations by key officers of companies that have faced these problems.

*Jordan D. Lewis, Bernard J. O'Keefe, Arthur J. Rosenberg, George A. Stephen, and Emery Olcott.*

**Methods in R&D Management in the Small Technical Company (29 Dec.)**
Arranged by Burton V. Dean.

The session will be devoted to four papers concerned with the applications of methods to solve problems in managing R&D activities in small technically based companies.

*Burton V. Dean, Jordan D. Lewis, Fred Hertzberg, and Peter L. Mullins.*

## Education (Q)

**Vice Presidential Address (27 Dec.)**
Speaker: R. Will Burnett.

*Is Relevance Irrelevant to Science Education?*

The validity of the science programs developed by scientists and teachers working in concert can hardly be questioned if the criterion of validity is scientific soundness. Modern programs are far better than earlier programs. Nonetheless it is legitimate and necessary to question the relevance of these programs when considered in the context of larger considerations of great importance. What is needed for science instruction to be relevant to such urgent problems as racism, pollution, overpopulation, hunger and malnutrition, conservation, the deterioration and collapse of our cities? What would be the nature of programs in which experts from the health sciences, conservation, other applied sciences, and from cognate disciplines such as psychology and anthropology were to work with science teachers over some years? I am suggesting that our modern science programs, however good, are nonetheless irrelevant to some of our most pressing and fundamental problems. Indeed, I propose that funding be got for such scrutiny and for the development of programs that are valid both from a scientific point of view and in terms of more complete relevance to the concerns of young people and the world they live in today and must somehow bring to heel tomorrow.

**Undergraduate Studies in Environmental Science (27 Dec.)**
Arranged by Everett M. Hafner.

In the face of a rising tide of danger to the quality of man's environment, American scientists and educators are beginning to build academic support for the study of environmental science as a new discipline. Their aim is to place it beside the conventional sciences with full and equal status, thus to attract talented students to intensive preparation for new and continuing crises in the decades ahead. It is essential to such preparation that it not be delayed beyond the years of undergraduate study. The symposium will look at ways in which colleges are planning to meet the challenge. It will also invite the participation of students already committed to the ideals of the movement, who have organized themselves for the purpose of giving it additional force and direction.

*Bernard Berger, S. Fred Singer, Garrett Hardin, Grover C. Stephens, Everett M. Hafner, Joseph Rhodes, Jr., Steven Shapiro, and David Perasso.*

**Nature Study and Conservation Education for Urban Communities (27–29 Dec.)**
Arranged by Crayton Jackson.

*Phyllis S. Busch, Joan Rosner, Leonise Aubry, Robert H. Lee, Edward A. Ames, Martin W. Schein, John A. Gustafson, Douglas A. Wade, Brand Konhein, David Perasso, James Swan, Spenser Havlick, Helen S. Russell, John Brinerd, Ruth Scott, William S. Sharp, F. H. E. Churchill, C. E. Mohr, Willard D. Wilder, Vivian D. Windley, and Robert Carlisle.*

**Science Education—Two Views (27 Dec.)**
Arranged by Stanley R. Wachs and George E. Hein.

*George E. Hein, Richard M. Harbeck, Charles Haynie, Leo Schubert, Randolph R. Brown, Barbara A. Prokupek, Steve Schwartz, Walter J. Wasiuk, Hiram Bleecker, and Maurice Belanger.*

**Questioning Assumptions Underlying Science Education in the United States (28 Dec.)**
Arranged by David E. Newton.

Some science educators feel that existing programs for the preparation of science teachers may be inadequate and ineffective. The changes in our society over the past few years and the changes which we anticipate in the near future may make these programs even more inadequate and inappropriate for the education in the 1970's and 1980's. It seems possible that the only way to revamp teacher education is to begin entirely anew: to discard all basic assumptions about the nature of schools and the nature of teacher education and to rethink from the beginning our beliefs about how teachers should be prepared for whatever education will exist in the last third of the 20th century.

*David E. Newton, Michael A. Burton, Richard D. Konicek, John J. Koran, Jr., and A. Harris Stone.*

**Educational Technology and Science Education (28 Dec.)**
Arranged by Albert F. Eiss.

Educational technology is the application of learning theory to curriculum planning. This technique promises great potential for the improvement of instruction. In this session some of the current activities in this field will be discussed.

*Martin Annis, George M. Ziener, Francis X. Finigan, Priscilla Ransohoff, Charles R. Botticelli, and Albert P. Burkhardt, Jr.*

**Learning: A Lifetime Process (29 Dec.)**
Arranged by Albert F. Eiss.

This session will deal with the changing emphasis in science education from teacher-centered classrooms to learner-centered laboratories. An analysis of the goals of education shows a wide divergence between theory and practice. The session will attempt to analyze some of the related problems and point to possible solutions for the future.

*Albert F. Eiss, Mary B. Harbeck, Russell Raycroft, Donald G. Decker, and Donald S. Kramer.*

**Creativity: Divergent Viewpoints and Implications (29 Dec.)**
Arranged by Irving A. Taylor.

This is a symposium on divergent viewpoints on creativity and their implications. With a focus on higher education, speakers holding highly different viewpoints on the nature of the creative process will speak on science, art, industry, education, and psychology. The positions, deliberately emphasizing differences, is to demonstrate divergency rather than consistency, and the implications and impact of these divergencies will be explored.

*J. Stacy Adams, Robert Ward, Howard G. Tennent, John Baird, Irving A. Taylor, E. Paul Torrance, and Sidney Parnes.*

**Panel Discussion on Preservice Science in Elementary School Teachers (29 Dec.)**
Arranged by John R. Mayor and Arthur H. Livermore.

*Deborah Partridge Wolfe, Randolph R. Brown, James M. Cooper, J. Dudley Herron, Mary Budd Rowe, and Albert H. Yee.*

**Presidential Address (American Nature Society) (29 Dec.)**
Speaker: William B. Stapp.

*The Role of American Nature Society in a Changing Society.*

**Science Education and the Nation (30 Dec.)**
Arranged by Willard J. Jacobson.

This program has been planned as an extension of the symposium on science policy held at the 1968 convention AAAS Meeting in Dallas.

*Willard J. Jacobson, Gerald Holton, Thomas Fontaine, Morsley Giddings, and Majorie Gardner.*

**Basic Research Related to Education (30 Dec.)**
Arranged by Howard F. Hjelm and Laurence G. Goebel.

Until recently there has been little recognition of the importance of basic research to continuing development and progress in the nation's schools. Political and social expediency dictated that research and development activities be directed almost entirely to applied efforts from which more visible advances could be reasonably expected in a shorter period of time. Educators are now beginning to appreciate the need for more reliable fundamental knowledge about human behavior and the conditions that affect learning. There is a growing awareness of the scarcity of such knowledge, and an increasing understanding that sustained support for scientific inquiry is essential to provide the knowledge base on which education must depend if continued progress is to be expected.

*Howard F. Hjelm, Hendrik D. Gideonse, Jacob W. Getzels, and Patrick Suppes.*

**School Science—Past and Future (30 Dec.)**
Arranged by A. A. Strassenburg.

One complete generation of new high school science and mathematics courses have now been completed. What lessons have been learned about curriculum innovation from experiences with these projects? Are existing course materials adequate to serve present needs or should new projects be encouraged? If new projects are needed, what are the desired characteristics of the output and how should the effort be organized?

There may be needs even more pressing than new curriculum projects. It is important to assess these and to focus attention on ways to meet them. One speaker will report on a study which reveals that most school students are still learning very little science. A student will present her views on the difficulties she experienced learning science in the schools. University scientists, after generations of neglect, are currently leading school science innovation. Should school teachers be performing this function themselves? If so, what role should university scientists play? Besides paying the bills, what role should the government play?

*Emery Will, Arnold B. Grobman, Jerrold R. Zacharias, Edward G. Begle, George C. Pimentel, A. A. Strassenberg, Elizabeth Wood, Janna Dreseden, Alfred B. Garrett, Liallyn Clapp, and Thomas D. Fontaine.*

## Information and Communication (T)

**Vice Presidential Address (29 Dec.)**
Speaker: Dale Baker.

*Communications or Chaos.*


Reprinted from *Collected Works of Buck Rogers in the 25th Century* by Phil Nowlan and Dick Calkin. Copyright 1969 Chelsea House Publishers, New York City. Reprinted by permission.

**Science Fiction and Science (27 Dec.)**
Arranged by Eugene Kone.

*Athelstan Spilhaus, Isaac Asimov, B. F. Skinner, and Raymond Seeger.*

**Technical Communication (27 Dec.)**
Arranged by Paul Flint.

Information overload due to the increasingly massive generation of scientific and technological material is clearly a matter of serious concern, and one approach to mitigation of the problem has been improving the effectiveness of communication by developing standards of presentation, including conventions of nomenclature. One important project, for example, has been the development of specifications for the organization of the technical manuals.

*Paul Flint and Richard Frehsee.*

**Specialization versus Integration of Knowledge in an Expanding Universe of Facts (28 Dec.)**
Arranged by Joachim Wohlwill.

This symposium will concern itself with a particular facet of the "information explosion," that is, the problems of integrating and interrelating the mass of scientific data accumulating at the prevailing exponential rates of increase, so as to yield a cohesive body of scientific knowledge. This question will be approached from several angles: a structural model of the growth of information networks will be presented, designed to reveal the balance of forces between accumulation of data and construction of links or "bridges" between them; the role of computer technology in the organization of facts and ideas will be elucidated; problems of verbal communication of scientific facts and ideas will be considered, and the influence of societal and institutional forces governing the rate of accumulation of scientific data will be scrutinized.

*Joachim Wohlwill, Manfred Kochen, Joseph C. R. Licklider, and F. Peter Woodford.*

**SATCOM Report, Its Implications and Impact (28 Dec.)**
Arranged by Dale Baker.

The 55 recommendations for solution of the pressing national problem in scientific and technical communication are the result of a three-year study.

Panel members representing different areas of the communicative arts will analyze and discuss the report from the basis of their experience and judgment as to the implications and impact of the report. SATCOM members will highlight the report and answer questions and problems which the panel may pose. The audience will be invited to comment and ask questions.

*Phyllis Parkins, Robert W. Cairns, John Sherrod, Robert A. Harte, Gordon L. Walker, and Eugene B. Jackson.*

**Economics of Scientific Publication (29 Dec.)**
Arranged by Burton W. Adkinson.

The impact of new technologies, the continuing increase in scientific writing, the changing patterns of research, and the change in financial support have created economic as well as other problems for publishers of scientific materials. The impact of the above conditions results in increasing costs to the users. A representative from a university press, a scientific society, and a commercial press

will discuss the present situation and the future outlook for scientific publications.

*Burton W. Adkinson, William Koch, James Barsky, and Carroll Bowen.*

## Statistics (U)

**Vice Presidential Address (27 Dec.)**
Speaker: Ezra Glaser.

*Issues in the Design of a Federal Statistical System.*

**Statistics, Governments, and the Analysis of Social Problems (27 Dec.)**
Arranged by Ezra Glaser.

The constructive contribution of statistical methodology and materials to the understanding and alleviation of social problems is hindered by several kinds of restraints: financial, organizational, and limitations of technical skill, among others. The most serious shortcoming is the primitive state of the art of designing statistical systems to describe economic and social processes.

Historically, subsystems have been developed, especially by the federal government, which produce rich flows of data, for example, on economic activity, crop production, births, and deaths, the occurrence of illness, prices, school attendance, bank deposits. Surprisingly, then, the record is poor when the interactions among poverty, educational disadvantagement, poor health, and other socioeconomic conditions are the subject of study.

The first session will contain reports by designers and operators of information systems directed at the urban officials.

The second session takes up some of the issues in the construction of a socioeconomically oriented statistical system which is operable in a nationwide context.

*W. W. Cooper, Norman Johnson, Charles Eastman, Jerome Laulicht, Kenneth Kortanek, John F. Collins, Frank Carr, Mark E. Keane, Nestor E. Terleckyj, Marvin Hoffenberg, Peter L. Szanton, Ezra Glaser, Arthur Miller, and Robert Grosse.*

**Methodological Problems in Studying Development of Ability (28 Dec.)**
Arranged by Rosedith Sitgreaves.

*Jerome Kagan, Mark Golden, Albert E. Beaton, David Elkind, and Beverly Birns.*

**Methodological Problems in Studying Crime (28 Dec.)**
Arranged by Rosedith Sitgreaves.

*Charles Kingston, Richard Myren, Clarence Sherwood, and Henry Solomon.*

**Evaluating Family Planning Programs (29 Dec.)**
Arranged by Zenas Sykes.

*William G. Cochran, T. Paul Schultz, William Seltzer, H. Bradley Wells, Robert G. Potter, Arthur A. Campbell, David M. Heer, Alan Ross, and Christopher Tietze.*

**Population Mathematics (29 Dec.)**
Arranged by Zenas Sykes.

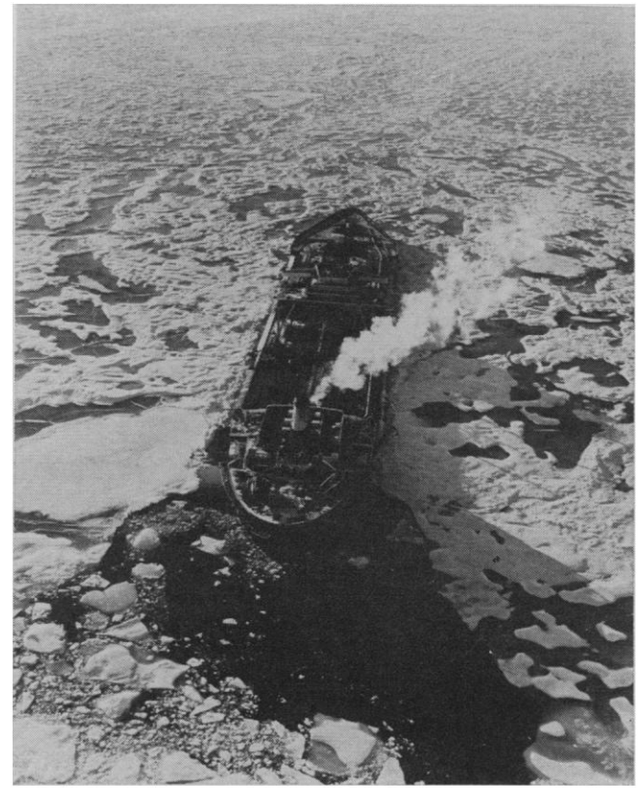
*Douglas Chapman, Nathan Keyfitz, Jane Menken, David B. Mertz, Lamont C. Cole, and Joel Cohen.*

## Atmospheric and Hydrospheric Sciences (W)

**The Northwest Passage (26 Dec.)**
Arranged by Richard VanHaagen.

The speaker will explore the opportunities which will arise if surface ships regularly transit the Arctic. Opportunities will exist in geophysics, botany, oceanography, and meteorology, snow ice and permafrost mechanics, zoology, and other sciences. Speakers will forecast the timetables and probabilities that they personally feel are realistic, both for development of the required technology and for the beginning of scheduled surface transportation.

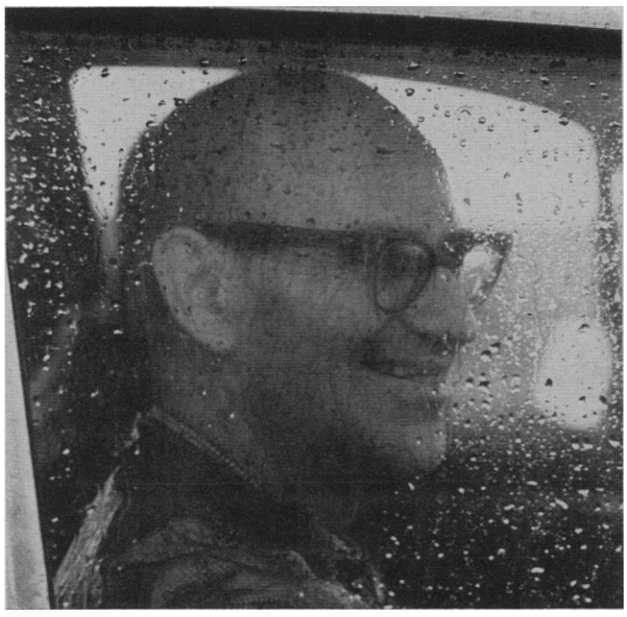
*Alfred A. Keil, Charles C. Bates, Roderick M. White, Paul Fournier, and Stanley B. Haas.*



The S.S. *Manhattan* plowing through the ice. [Humble Oil Company, Houston, Texas]

**Climate and Man (29 Dec.)**
Arranged by Louis Battan.

For billions of years, the climate of the earth has changed, alternating between warm and cold periods of varying length. Ice sheets and sea ice have moved equa-



(Left) Climate and Man Symposium, 29 Dec. [Bureau of Reclamation]. (Right) The Atmospheric Sciences Symposium, 30 Dec. [Bureau of Reclamation]

torward during the cold ice ages and retreated during warm periods. Many theories have been advanced to explain the changes in climate. Some of them try to account for climate in terms of variations in solar radiation. Other theories ascribe climate alterations to such phenomena as mountain building, volcanic eruptions or changes in sea level.

Since the start of the Industrial Revolution man has put increasing quantities of gases, particulates and heat into the atmosphere. There is evidence that these emissions have influenced the climate during this century. At the same time, changes in climate have had profound influences on man and his civilization. We are faced with questions about the degree to which man is modifying the climate and the result of such modification on life as we know it.

*Walter Orr Roberts, J. Murray Mitchell, Jr., Edward N. Lorenz, Peter K. Weyl, Erik Eriksson, Stanley A. Schumm, Thomas F. Malone, Gordon J. F. MacDonald, Helmut E. Landsbert, Robert M. White, Daniel A. Livingstone, and Glenn R. Hilst.*

**The Atmospheric Sciences (30 Dec.)**

Arranged by George S. Benton and Kenneth C. Spengler.

*George S. Benton, Richard J. Reed, Joachim P. Kuettner, Henry G. Houghton, Francis W. Reichelderfer, Horace R. Byers, Thomas F. Malone, Verner E. Suomi, and Henry G. Houghton.*

## General Sciences (X)

**Academy Conference (27 Dec.)**

Arranged by John H. Melvin.

*Wilmer W. Tanner, M. Frank Hersman, Harry J. Bennett, John Mayor, Howard F. Foncannon, and John H. Melvin.*

**The Academy Conference and Our Future Environment (27 Dec.)**

Speaker: Wilmer W. Tanner.

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*Registration forms for the meeting, hotels, and tours appear on pages 1066–67 of this issue of* Science. *Information about tours, special exhibits, educational exhibits, the Science Film Theater, and musical events appear in the 31 October issue. Reports about symposia appear in the following issues: 19 Sept., "Tektite: A Study of Human Behavior in a Hostile Environment"; 26 Sept., "Expanding Horizons in Medical Education"; 3 Oct., "Education of the Infant and Young Child"; 10 Oct., "Is There an Optimum Level of Population?," Approaches to Policy Sciences," and "Sea-Level Panama Canal"; 17 Oct., "Quantitative Studies of Urban Problems" and "Our Food Supply"; 24 Oct., "Physiological Effects of Audible Sound," "Climate and Man," and "Rational Use of Water"; 31 Oct., "Technology Assessment and Human Possibilities," "Pattern Perception," and "Youth: Ego-Ideals and Impact of Culture"; 7 Nov., "Space Astronomy," "Science Policy and State Government," "The Nature and Dignity of Man," and "Behavioral and Social Sciences: Outlook and Needs"; 14 Nov., "School Science—Past and Future," "Power Generation and Environmental Change," and "Effects of Nutrition on Behavior."*

# AAAS ANNUAL MEETING

**26–31 December 1969, Boston**

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

## ADVANCE REGISTRATION FORM

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

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

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

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

☐ Enclosed is $5 for the *Program* only

☐ Enclosed is $..... for tours.

**(Mailing date of program and badge will be 1 Dec.)**

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

MULTIPLE REGISTRATION:_____
(List full name for spouse and each student.)

MAILING ADDRESS:_____
(For receipt of *Program*) (Street) (City/State) (Zip Code)

INSTITUTION OR
COMPANY AFFILIATION:_____

_____
(City) (State) (Zip Code)

CONVENTION ADDRESS:_____

## TOURS AND SPECIAL EVENTS

The AAAS is pleased to offer tours and special events for registrants (only) at the Association's Annual Meeting. Chartered buses will provide transportation. The only fee involved, except in the case of the concert, is for transportation. Please use this form to register. Indicate the number of tickets you wish to order. Enclose payment. Attendance is limited; early registration is recommended. **No refunds after 15 Dec.** Tour participants will visit "behind-the-scenes" of the establishments and hear about work in progress.

| Number of Tickets | Tour or Special Event |
|---|---|
| _____ | Worcester Foundation for Experimental Biology, 27 Dec., 9:00 a.m.–3:00 p.m. (**$3.00**) |
| | New England Aquarium, 8:30–11:30 a.m. (**$3.00**; includes **$1.00** admission fee) |
| _____ | 27 Dec. |
| _____ | 29 Dec. |
| _____ | Boston Symphony Orchestra Concert, 29 Dec., 8:30 p.m., Symphony Hall (Tickets **$5.00** each; no transportation is provided.) |
| _____ | Cambridge Electron Accelerator, 29 Dec., 9:00–11:30 a.m. (**$2.00**) |
| | Massachusetts General Hospital, 9:00 a.m.–12:15 p.m. (**$2.00**) |
| _____ | 29 Dec. |
| _____ | 30 Dec. |
| _____ | M.I.T., 29 Dec., 8:30 a.m.–noon (**$2.00**) |
| _____ | M.I.T. Educational Presentation, 29 Dec., 1:30–4:30 p.m. (**$2.00**) |
| _____ | Isabella Stewart Gardner Museum, 30 Dec., 2:00–5:00 p.m. (**$2.00**) |
| _____ | Museum of Fine Arts, 30 Dec., 9:30 a.m.–1:00 p.m. (**$3.00**; includes **$1.00** admission fee) |
| _____ | Museum of Science, 30 Dec., 10:00 a.m.–12:30 p.m. (**$2.00**) (luncheon included) |
| _____ | Woods Hole Oceanographic Institution, Marine Biological Laboratories, and U.S. Bureau of Commercial Fisheries, 30 Dec., 9:30 a.m.–5:00 p.m. (**$4.00**) |
| _____ | Harvard University, 30 Dec., 1:30–4:30 p.m. (**$2.00**) |
| _____ | Total number of tickets. $_____ total amount remitted for tours. |

No fee is involved for the following events, but tickets are required. Please indicate the number of tickets you require. No transportation is provided.

_____ Science/Music Symposium, 27 Dec., 8:30 p.m., Jordan Hall of New England Conservatory.

_____ Tea at the headquarters of the American Meteorological Society, 28 Dec., 3:00–5:00 p.m. **(Ladies only)**

# HOTEL REGISTRATION

The American Association for the Advancement of Science will hold its 1969 Annual Meeting in Boston, Mass., 26–31 December 1969. The following hotels will be used for housing. Registration desks will be located at the Sheraton-Boston Hotel, Statler-Hilton Hotel, and the War Memorial Auditorium. For location of offices and sessions, see page 1158 of the 12 September issue of *Science*.

## HOTEL RATES* (Per Day)

| | HOTEL | SINGLE | DOUBLE | TWIN | SUITES |
|---|---|---|---|---|---|
| | Cambridge Charterhouse**<br>5 Cambridge Parkway | $16.00 | $22.00 | $22.00 | ——— |
| 1 | Copley Square Hotel<br>47 Huntington Avenue | 13.50-15.50 | 18.50-19.50 | 19.50-20.50 | $25.00-up |
| | Essex Hotel**<br>695 Atlantic Avenue | 11.50-12.50 | 17.50 | 18.50 | ——— |
| | Holiday Inn-Charles River**<br>5 Blossom Street | ——— | 18.00 | 23.00 | |
| 2 | Lenox Hotel<br>710 Boylston Street | 15.50-19.50 | 18.50-24.50 | 21.50-26.50 | 21.00-up |
| | Madison Hotel**<br>25 Nashua Street | 10.75-14.75 | 14.75-18.75 | 16.75-19.75 | 29.75-up |
| 3 | Midtown Motor Inn<br>220 Huntington Avenue | 16.00-18.00 | ——— | 22.00-24.00 | |
| | Parker House Hotel**<br>60 School Street | 13.00 | 17.00 | 21.00 | 37.50-up |
| 4 | Sheraton-Boston Hotel<br>Prudential Center | 14.00-23.00 | 24.00-26.00 | 24.00-29.00 | 39.00-up |
| 5 | Sheraton Plaza Hotel<br>Copley Square | 17.00-20.00 | 23.00-26.00 | 23.00-26.00 | 45.00-up |
| 6 | Somerset Hotel<br>400 Commonwealth Avenue | 17.00 | ——— | 21.00 | ——— |
| 7 | Statler-Hilton Hotel<br>Park Square | 16.00-20.00 | 23.00-25.00 | 25.00-27.00 | 61.00-up |

* Massachusetts Room Tax, 5.7%; rates for suites: parlor plus one-, two-, three-bedroom; $4.00-5.00 additional charge for cots.
** Not shown on map, page 1158 of the 12 September issue of *Science*.

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## HOTEL RESERVATIONS FORM

**Mail To: AAAS Housing Bureau, Greater Boston Chamber of Commerce, 125 High Street, Boston, Massachusetts 02110**

(Reservations received after 13 December cannot be assured.)

CHOICE OF HOTEL: First_____ Second_____ Third_____

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

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

_____

_____

ARRIVAL: Date_____; _____ a.m. _____ p.m.

DEPARTURE: Date_____; _____ a.m. _____ p.m.

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

NAME:_____
(Individual requesting reservation)

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