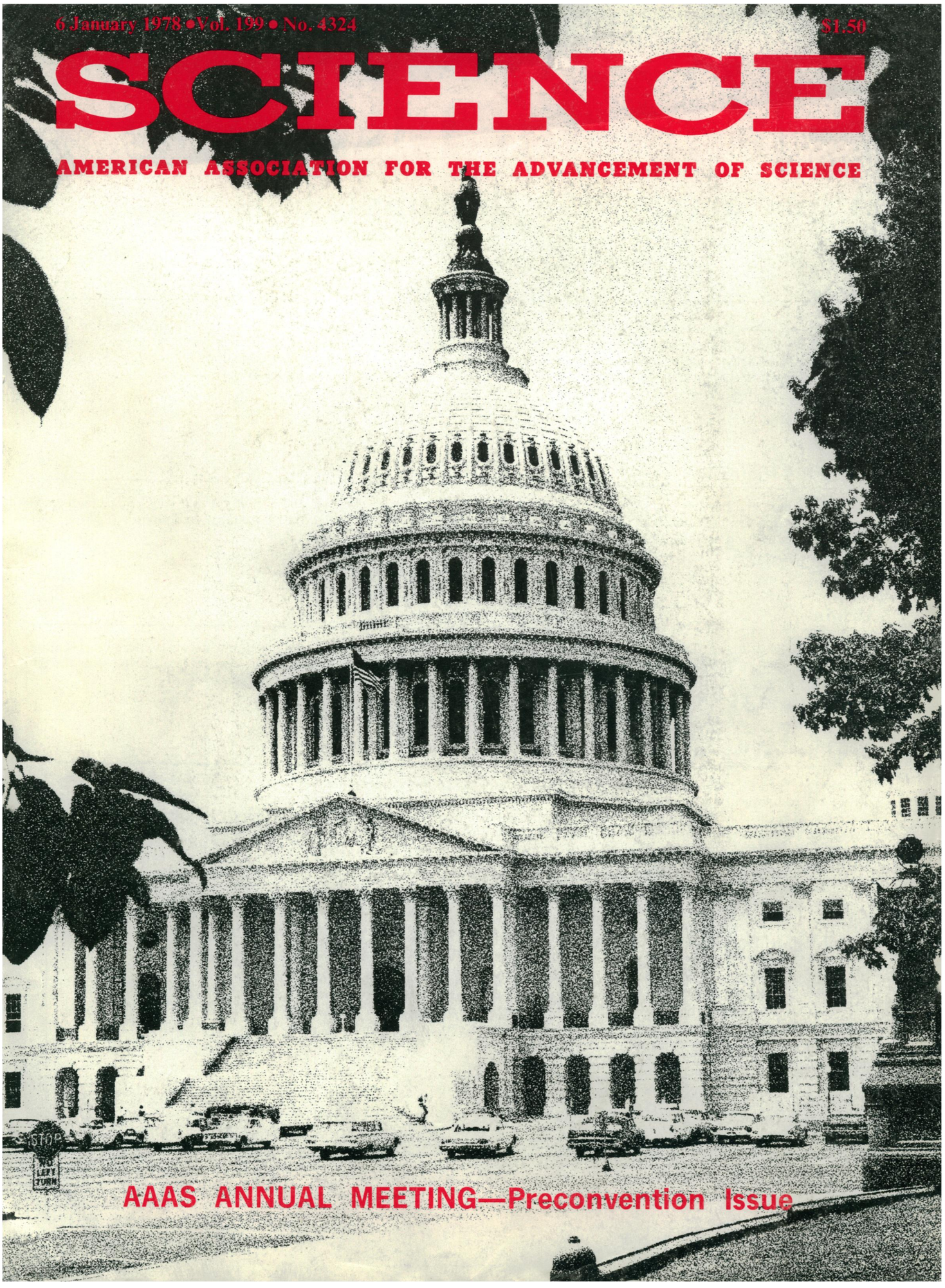
6 January 1978 • Vol. 199 • No. 4324 $1.50

SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



AAAS ANNUAL MEETING—Preconvention Issue

Science for Listening

A special sale while the supply lasts

Cancer

Why? This most baffling question is asked every day by over 1000 Americans. Cancer is a disease of fear, anxieties, and of the unknown. On four hour-long cassettes, science journalists interview 19 leading physicians and cancer researchers. Listen to what the experts in medical science know now and the hope that future research holds. The album is accompanied by a 40-page booklet condensing information contained in the series of tape-recorded narratives. Order the entire package or the booklet alone.

List price: ~~$49.95~~ 35.00.

Booklet alone: $2.50

Energy: A Dialogue

A six-tape album and booklet focus on three major themes: the energy crisis, what it is and how it got that way; the technological options, what they are and how much they will cost; and the interrelationships of energy, the environment and politics and how these affect our lifestyles and personal finances.

List price: ~~$49.95~~ 35.00

Origins

What is the genesis, life, and death of a star? How was the universe created? What are the origins of our own existence? Four leading scientists probe these and other questions in four 50-minute cassettes and accompanying booklet. For the inquisitive mind, for the science student, for all those who want to expand their inner view of the infinite reaches of time and space.

List Price: ~~$49.95~~ 35.00

The Physical World

Intended for the professional, *The Physical World* contains six lectures which explore the theory and techniques of scattering methods, the evolution of solid state theory, the various types of nuclear phenomena, as well as questions about how physicists and the lay public can share "the thrill of discovery and the satisfaction of understanding." The accompanying booklet contains reproductions of many of the slides used in the original presentations.

List price: ~~$69.95~~ 55.00

Speaking of Science

AAAS created this series to help you understand the world through science. Conversations between well-known scientists and science writers explore pertinent scientific issues, discoveries and topics of research. Designed for listening both at home and in the classroom, each volume contains 12 scintillating half-hour conversations certain to spark hours of interesting and informative discussions.

A partial listing of the conversations

Volume I: Health Care and Delivery; Technology Today; the Finite Earth.

~~List price: $39.95~~ sold out

Volume II: The Dilemma of Prisons; New Dimensions in Human Genetics; Energy Rationing.

List price: ~~$39.95~~ 35.00

Volume III: The Science of Violence; Population Policy and Human Development; The Earth's Fire.

List price: ~~$39.95~~ 35.00

Order Form

Please send the following at the reduced prices:

_____Cancer Album—$35.00
_____Cancer Booklet—$2.50
_____Energy: A Dialogue—$35.00
_____Origins—$30.00
_____The Physical World—$55.00
_____Speaking of Science (Vol. II)—$35.00
_____Speaking of Science (Vol. III)—$35.00

TOTAL AMOUNT ENCLOSED_____

Check or purchase order must accompany all orders. **DO NOT SEND CASH.**

Name _____

Address _____

City _____

State_____ **Zip**_____

Mail to:

aaas

AAAS, Dept. A-1
1515 Massachusetts Ave., NW
Washington, DC 20005

(Please allow 6 to 8 weeks for delivery.)

IF YOU THINK IT DOESN'T MAKE MUCH DIFFERENCE
WHERE YOU BUY YOUR LIFE INSURANCE...

please look at this cost comparison for $50,000 5-Year Renewable Term Policies issued by TIAA and the ten largest U.S. life insurance companies!

20-Year Average Annual Costs* for $50,000 5-Year Renewable Term Policies

	Policies Issued To Men			Policies Issued To Women		
	Issue age 25	Issue age 35	Issue age 45	Issue age 25	Issue age 35	Issue age 45
TIAA	**$102.50**	**$213.50**	**$497.00**	**$ 81.50**	**$142.50**	**$316.50**
10 Largest U.S. Companies:						
Aetna	216.00	352.00	814.00	210.00	301.00	644.50
Connecticut General	223.00	378.50	816.50	204.00	313.00	673.00
Equitable	187.00	343.50	754.00	163.50	297.50	677.50
John Hancock	200.50	344.00	750.00	192.00	307.50	659.00
Massachusetts Mutual	196.00	337.50	737.00	184.50	313.00	683.00
Metropolitan	188.50	347.00	779.50	162.50	267.00	565.00
New York Life	189.00	337.50	751.00	171.00	281.00	602.00
Northwestern Mutual	163.00	300.00	684.00	147.00	264.00	592.00
Prudential	164.00	300.00	592.00	146.00	242.00	462.00
Travelers	200.50	360.50	820.00	182.00	281.00	603.00
Mean Cost for 10 Companies	**192.75**	**340.05**	**749.80**	**176.25**	**286.70**	**616.10**

*Based on 1977 premium rates and dividend scales, adjusted for interest (4%) to recognize the time value of money; dividends not guaranteed.

You can see from these figures that owners of TIAA policies enjoy substantial cost advantages over persons insured by the country's largest commercial life insurance companies—companies that sell one in every three policies purchased by Americans each year. As a staff member (either full-time or part-time) of a nonprofit educational institution you are one of the limited group that qualifies for TIAA and the big savings this eligibility can bring.

To give you an idea of savings possible, the figures show that, as compared to TIAA:

the mean cost for $50,000 5-Year Renewable Term policies issued to 35-year old men by the ten largest companies is 59% higher, a dollar difference favoring TIAA, adding up to more than $2,500 over the next 20 years; even the company in the group that appears to offer the best bargain demands a cost 40% higher than TIAA's;

the mean cost for $50,000 policies issued to 35-year old women by the ten companies is double that of TIAA, indicating savings close to $2,900 for the person choosing TIAA; for the most attractive commercial policy shown, women will pay 70% more over the years than for a TIAA policy giving them the same benefits.

You can get all the facts about a TIAA 5-Year Renewable Term policy that can help secure the future for your family by contacting the TIAA LIFE INSURANCE ADVISORY CENTER. Either telephone collect 212-490-9000 and ask for one of the Insurance Counselors

Alan L. Fox, C.L.U. Joan Scott, C.L.U. Kenneth Sawyer Robert Cassidy

Or mail this coupon. In either case there are no strings attached and no one will call on you.

Life Insurance Advisory Center
TEACHERS INSURANCE & ANNUITY ASSOCIATION
730 Third Avenue, New York, N.Y. 10017

Li

Yes—I'd like to know more about TIAA 5-Year Renewable Term Insurance policies. Please send personal illustrations for my age.

Name and Title _____ Date of Birth _____

Address _____

City, State, Zip _____

Nonprofit Employer (College, University, Private School, Etc.) _____

If your spouse is also eligible according to the rules described, please provide:

Spouse's Name _____ Date of Birth _____

Eligibility for TIAA is extended to employees of colleges, universities, private schools, and certain other nonprofit educational or scientific institutions, and to the employee's spouse when more than half of their earned income is from an eligible institution.

TIAA *The College World's Insurance Association*

ISSN 0036-8075

6 January 1978

Volume 199, No. 4324

SCIENCE

SCIENCE is published weekly, except the last week in December, but with an extra issue on the third Tuesday in September, by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Now combined with **The Scientific Monthly®**. Second-class postage paid at Washington, D.C., and additional entry. Member rates on request. Annual subscriptions $60; foreign postage: Canada $10; other surface $13; air-surface via Amsterdam $30. Single copies $1.50; $2 by mail (back issues $3) except **Guide to Scientific Instruments** $6. School year subscriptions: 9 months $45; 10 months $50. Provide 6 weeks' notice for change of address, giving new and old addresses and postal codes. Send a recent address label, including your 7-digit account number. **Postmaster: Send Form 3579 to Science, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005.**

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

U.S. Capitol. [J. R. Smith, U.S. Navy, Washington, D.C.] See page 45, AAAS Annual Meeting, 12–17 February 1978.

tailed time accounting is entirely irrelevant to this question. For mission-oriented agencies, the value of research done can be weighted for mission relevance. Checks could be made to be sure that reports of the same research are not submitted to justify more than one grant. Such a system would come closer to reflecting the actual needs of the government while taking some account of the realities of good research practice.

J. WOODS HALLEY
Tate Laboratory of Physics, School of Physics and Astronomy, University of Minnesota, Minneapolis 55455

Nobel Prize in Physiology or Medicine

In the article I prepared about the recipients of the 1977 Nobel prize in physiology or medicine (Research News, 11 Nov., p. 594), there were some errors and omissions which I was unable to correct before publication.

I should have mentioned that J. C. Hinsey and J. E. Markee, and also H. Friedgood, were probably the first to suggest humoral transport from the hypothalamus to the pituitary. I also failed to mention that Guillemin received substantial support for his research between 1970 and 1975 from the Office of Population of the Agency for International Development.

On page 595, paragraph 6, line 19, one of the three amino acids of thyrotropin releasing hormone (TRH) is erroneously given as "histamine." It should be *histidine*. On page 596, paragraph 2, line 9, the correct first name of Fortier is *Claude*.

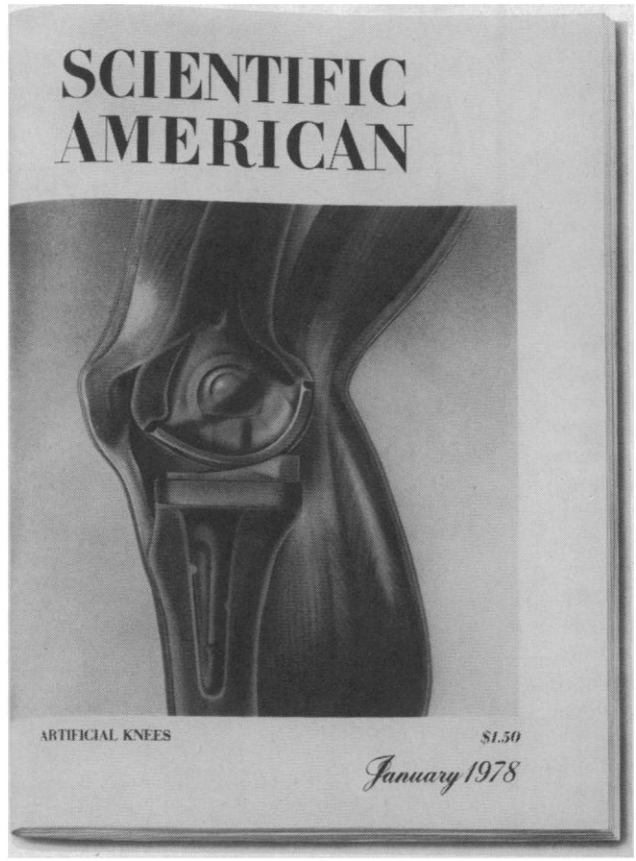
JOSEPH MEITES
Department of Physiology, Michigan State University, East Lansing 48824

Congressional Fellowship Stipend Raised for 1978

In the announcement of the 1978 competition for the AAAS Congressional Science Fellowships (16 Dec. 1977, p. 1100), the stipend was given incorrectly. The base stipend for 1978 is increased to $18,000. As stated in the announcement, four of the five awards this year will be to professionals in some area of child and family policy.

RICHARD A. SCRIBNER
AAAS Congressional Science Fellow Program, 1776 Massachusetts Avenue, NW, Washington, D.C. 20036

Carbon dioxide and the world climate... a growing dilemma.



Carbon dioxide in the atmosphere plays a decisive role in regulating the Earth's temperature. In recent decades, the burning of fossil fuels and the destruction of forests have increased the atmospheric concentration of CO_2. In the January SCIENTIFIC AMERICAN, you will find that the effect may be a warming of the Earth and a destabilizing of the climate-weather system on which human life depends. If we wait long enough to be certain, it may be too late. Yet the alternative, curtailment of fossil-fuel consumption and drastic changes in land use, could be as disruptive of human existence as the upset of the climate-weather system.

You will also read that success in replacement of bone and cartilage in the hip joint with a ball and socket of metal and polyethylene has now encouraged extension of this technique, with equal success, to replacement of the more complicated knee joint.

You will discover an archaeological dig that reveals the Carthage the Romans built after they fulfilled the fierce injunction of Cato the Elder: "Delenda est Carthago!"

This is some of the wide-ranging diversity that the regular readers of SCIENTIFIC AMERICAN enjoy each month. In our pages these readers have kept abreast of all the major developments in science that have made the last three decades the most momentous in intellectual history.

Consider what has occurred: the unlocking of the genetic code; the discovery of continental drift; the proof of uncertainty in logic; the recognition of the role of tool-making in our biological evolution; the sudden arrival of solid-state electronics, the microcomputer, the laser; the elucidation of the nerve circuitry that organizes perception; the penetration of the structure of the fundamental particles.

To our readers all this has been reported by the scientists who did the work. (Nearly all of the 65 Nobel prizewinners who have written for SCIENTIFIC AMERICAN did so in advance of their recognition by Stockholm.) The collaboration of our editors in the preparation of text and illustration makes this work accessible to a growing worldwide readership.

Subscribe now and learn why The New York Times calls SCIENTIFIC AMERICAN "This country's and perhaps the world's outstanding forum for communication between scientists and the intelligent public."

Use the coupon below to begin enjoying the diversity of articles in each monthly issue. A one-year subscription is only $18. A two-year subscription, at $33, saves $3. And a three-year subscription, at $45, saves you $9.

Send no money. We'll bill you.

SCIENTIFIC AMERICAN

WITH YOUR SUBSCRIPTION

THIS BONUS BOOK

As soon as your subscription payment is received, we will also send you *Cosmology +1* (regular price: $4.50), as a bonus. This anthology from SCIENTIFIC AMERICAN explores the radio galaxies, black holes, the curvature of space, quasars and: Will the universe expand forever? Is there intelligent life elsewhere?

SUBSCRIPTION RESERVATION
SCIENTIFIC AMERICAN 415 Madison Avenue, Dept. MS, New York, N.Y. 10017

Please enter my subscription to the monthly issues of SCIENTIFIC AMERICAN for the term I have checked. I understand that you will also send me—absolutely free—the 124-page book *Cosmology* +1 (regular price: $4.50), as soon as my payment is received.

YOUR GUARANTEE

You may cancel your subscription to SCIENTIFIC AMERICAN at any time and receive a refund for the balance of your subscription. The bonus book is yours to keep.

Name

Address

City/State/Zip

☐ 1 year—$18 ☐ 2 years—$33 (save $3) ☐ 3 years—$45 (save $9)

☐ Bill me ☐ My payment is enclosed

(Subscription rates outside U.S. and Canada: 1 year—$22 2 years—$40 3 years—$55)

MS

6 January 1978, Volume 199, Number 4324

SCIENCE

Research Opportunities in Fossil Fuels

The Syncrude project to produce oil from the Athabasca tar sands is an awesome sight. A 600-foot stack dominates the scene. A 260-megawatt power station will cogenerate process steam. Four mammoth electric-powered dragline scoops will retrieve tar sand from a 130- to 150-foot-thick bed lying some 50 feet beneath the surface. Two electric-powered conveyors 3 miles long and 6 feet wide will take the sand to what must be the world's largest washing machines, where tar and sand will be separated. The sand tailings will be initially stored in a large retention pond but ultimately returned to the diggings. The tar will be upgraded to a high-quality synthetic crude oil in a processing plant as big as a refinery. All this is being put in place in the northern climate of Mildred Lake, Alberta, Canada, 300 miles north of Edmonton. Syncrude will start up in 1978 and when fully operational, will average about 110,000 barrels per day of synthetic crude.

Over $2 billion will be spent at Mildred Lake before production begins. Even this is small when compared with the investment to recover oil and gas from the North Sea—that will be larger than the cost of Project Apollo. In different terms, the cost of the North Sea projects is currently $10,000 and more for each daily barrel of oil production capacity. Larger costs and corresponding research, development, and engineering will be involved in coal gasification and liquefaction, shale oil recovery, and deep drilling on the continental rise or the deep structures of the Gulf of Mexico. These are likely to be at least an order of magnitude more expensive than "conventional" oil production on shore.

Projects such as Syncrude and the North Sea are economically attractive only because of current and projected world energy prices. This situation carries over to solid hydrocarbons, where low-rank and high-sulfur coals may be gasified or liquefied before transportation and use, removing pollutants in the process. In the direct use of coal, complex and controlled combustion will be the rule—for example, fluid bed combustion to achieve acceptable flue gas quality.

The increasing costs of obtaining and using fossil fuels from low-quality or hard-to-get-at sources are impressive, but even more impressive is the opportunity provided for science and technology. Production, refining, and use of fossil fuels, already highly technology intensive, will continue to demand even more scientists and engineers. Chemistry is crucial, as are chemical, mechanical, and civil engineering. Catalysis, thermal chemical processing, and physical separation of chemical species have long been staples of petroleum refining. These same disciplines are involved in coal gasification and liquefaction. Technological improvements are needed to cut investment, to make conversion more energy efficient, and to improve the quality of products. This must be done with resource feeds of low quality, which will probably be high in contaminants such as sulfur, nitrogen, and heavy metals. New corrosion-resistant materials, improved designs, and better catalysts will be required. Computer control of complex chemical processes will be vital.

The coming years will see the creation of new industrial complexes based on fossil feeds. They will produce useful fuels and chemicals from a variety of inputs. The processes involved will be energy efficient, effluents will be reduced, and the toxicities of the products will be known and controlled. There are still many issues to be considered, such as the carbon dioxide greenhouse effect and the potential environmental damage of removing materials from the ground. Federal policies are a major uncertainty. Nevertheless, the opportunity for disciplined and creative minds is extraordinary.—EDWARD E. DAVID, JR., *President Elect, AAAS (1978), and President, EXXON Research and Engineering Company, Florham Park, New Jersey 07932*

New Copyright Law: Effects on *Science*, Contributors, and Users

A new copyright law became effective on 1 January. This law attempts to establish a new balance between the needs of users for access to the ideas expressed in documents and the rights of authors to obtain sufficient benefits from the distribution of documents to encourage them to make their ideas public. Documents are copyrightable, not ideas. The new law recognizes the fact that the fast, relatively cheap copying machines that have become accessible to users since the previous law was written in 1909 have displaced the old balance. These machines enable users to make copies without compensating the author or contributing to the cost of making the document available for use.

The major changes in the law that affect journals are:

1) Statutory copyright begins as soon as a document is written, rather than at the time of publication or registration, and it remains with the author or the author's employer unless he or she formally assigns it, or part of it, to someone else. This provision makes no distinction between authors who make their livings by sale of their writings and authors whose writings are secondary to their research and are contributed to journals.

2) Copyright in a collective work, such as *Science*, is separate from the copyrights in the individual works it contains, which, if they are not formally acquired by the journal publisher, remain with the authors.

3) The court-developed doctrine of "fair use"—that is, use of copyrighted material for nonprofit research and educational purposes without permission of or compensation to the copyright owner—is given statutory recognition.

To comply with these changes in the law, the AAAS must either obtain a copyright assignment from each contributor or arrange to turn over to contributors responsibility for handling requests for permission to use their materials. These requests now average 80 per week. Some contain lists of items, each from a different contributor. Others consist of general requests from university departments, specialized libraries, and abstracting services for use of all items on a particular subject. Moreover, it seems likely that the number of requests will increase under the new law, which places new restrictions on copying (see News and Comment, page 32).

Transfer of these responsibilities to contributors will be cumbersome for users, contributors, and the AAAS. It will make it more difficult and frustrating for users who wish to meet their increased responsibilities to contribute to the cost of making documents available for use. Furthermore, contributors will have to register their own copyrights and pay the registration fees if they wish to establish their right to sue for infringement.

In order to meet its responsibility to encourage use of material published in *Science* and recover a portion of the publishing costs from each user not protected by the "fair use" provisions of the new law, AAAS is taking three steps.

First, authors will be asked to assign their copyrights to AAAS. The document they will be asked to sign will include formal recognition of existing practices—namely, their right to reuse their own material for their own purposes, to veto specific but not general permissions granted by AAAS, and to obtain reassignment of their copyright from AAAS, without fee, if they wish to do so.

Second, AAAS has joined the Copyright Clearance Center, an organization which provides a new mechanism by which copying for uses excluded under the "fair use" provisions can be licensed by publishers without requiring specific permission for each use. This organization will provide a central place to which users can remit copying fees for redistribution to publishers. Participants in this organization will print a code number, including identification and price, on the first page of each article (see page 21). Thus users who do not copy from a journal frequently enough to warrant their taking out a subscription will be able to help pay publishing costs.

Third, *Science* will also establish and maintain, beginning with the first issue in 1978, a stock of reprints of most items published in *Science*, particularly Editorials, Articles, News and Comment, Research News, and Reports. Orders will be accepted for all items, and reprints will be shipped within 1 week from stock and within 2 weeks if printing is required.—R.V.O.

Meeting Information

Listed below are the Washington hotels which are used by the AAAS for housing and program activities during the Annual Meeting. The two-letter codes in parentheses identify session locations in the preliminary program.

Sheraton-Park (SP): Symposia and public lectures; contributed-paper (poster and slide) sessions; business meetings; registration, information, and ticket desks; message center; welcome center (hospitality); resource center for the disabled; SCIENCE INTERNATIONAL (featuring the *Tools of Science* exhibits); headquarters office; newsroom; employment information center.

Shoreham Americana (SA): Symposia, contributed-paper (slide) sessions; business meetings; registration and information desks; *Science Film Festival*.

The two hotels are located within easy walking distance of each other. For precise locations see map on page 1243 of the 23 December issue.

Registration

Meeting attendants are encouraged to register in advance to obtain a detailed preview of the symposia, lectures, tours, and other activities scheduled during the Meeting. Registration fees are listed on the registration form on page 000 in this issue. Please note that special 1-day attendance registration is available on site at the meeting registration desks at $12 (regular) and $6 (student). Also available on site is the volume of abstracts of symposium papers and contributed papers presented at the Washington Meeting, for the purchase price of $5.

The meeting program (*not including abstracts*), badge, and condensed program (foldout) will be mailed to advance registrants on or about 13 January 1978.

On-site registration desks will be located at the Sheraton-Park (Upper Concourse) and at the Shoreham Americana (West Lobby). Registration hours at both locations are as follows:

Sunday, 12 February	2:00 p.m. to 6:00 p.m.
Monday through Thursday, 13–16 February	8:00 a.m. to 6:00 p.m.
Friday, 17 February	8:00 a.m. to 12 noon

Registration Refunds

The AAAS will refund advance registration fees for all cancellations received in writing or by telegram prior to 6 February 1978. NO REFUNDS WILL BE MADE ON CANCELLATION NOTICES RECEIVED AFTER THIS DATE. Refunds will be mailed from the AAAS Offices in Washington, following the Annual Meeting.

Tax Deduction for Educational Expenses

Please note that U.S. Treasury Regulation §1.162-5 permits an income tax deduction for educational expenses (registration fees, and cost of travel, meals, and lodging) undertaken to: (1) maintain or improve skills required in one's employment or other trade or business, or (2) meet express requirements of an employer or a law imposed as a condition to retention of employment, job status, or rate of compensation. This is true even for education which leads to a degree.

Housing

In cooperation with the AAAS, the two Washington hotels used for housing and meetings have set aside—at guaranteed reduced rates—blocks of guest rooms for attendants of the Annual Meeting. The reservation form on page 57 of this issue lists the hotels and their rates. **These rates are guaranteed only when reservations are made through the AAAS Housing Bureau on the official reservation form prior to 20 January 1978.**

Hotel rooms are assigned on a first-come, first-served basis. Persons submitting their housing requests late cannot be assured of room assignments at the hotel of their choice or at the requested rates. If the room rate specified is no longer available, the next available higher rate will be assigned. If the first choice hotel specified is no longer available, the Housing Bureau will assign the second choice requested. Confirmation will come to you directly from the hotel. It is, however, requested that all reservation changes and cancellations be made through the Housing Bureau *in writing*. Room assignments will be delayed if any information is omitted from the form.

For the Washington Meeting, the AAAS has obtained special hotel rates for students. *Students planning to take advantage of these special rates must make their reservations in prearranged groups of 3 or 4 which arrive and depart on the same date*. Neither AAAS nor the Housing Bureau can act as roommate coordinators.

On request, the hotels will accommodate additional persons in guest rooms (for example, three in a double room) for $10 per additional person. The charge for rollaway beds or cots is also $10. The Sheraton-Park accommodates children aged 18 and under free of charge in same room with parents; the Shoreham's age limit is 14 and under.

Resources for Disabled Attendants

The AAAS, in cooperation with the Washington Advisory Committee, is again making every effort to make the Annual Meeting fully accessible to disabled individuals. In addition to hotel rooms which can accommodate wheelchairs, and accessible meeting areas, the following resources will be available:

- A Resource Center staffed with volunteers to offer assistance on request as part of the hospitality and registration center.
- Assistance in movement within and between meeting hotels, as needed.
- Transportation service to and from airports, and train and bus stations.
- Interpreters (sign language and oral) at all public lectures, and for other sessions on request.
- Repair service for wheelchairs.
- Round-the-clock telephone service responding to emergency needs.
- Special tour and sightseeing information for disabled persons.
- Audiotaped highlights of the meeting program for persons with visual impairments.

The Washington Advisory Committee is making a special effort to ensure that every aspect of the Meeting is barrier-free. Persons needing special hotel accommodations, interpreting services, or other assistance are strongly urged to so indicate on the advance registration and hotel reservation forms. Early response will help us to plan and serve you better. For additional information or suggestions, *contact Martha Redden, Cheryl Davis, or Wayne Fortunato-Schwandt, AAAS Project on the Handicapped in Science, 1776 Massachusetts Avenue, NW, Washington, D.C. 20036 (phone: 202-467-4497).*

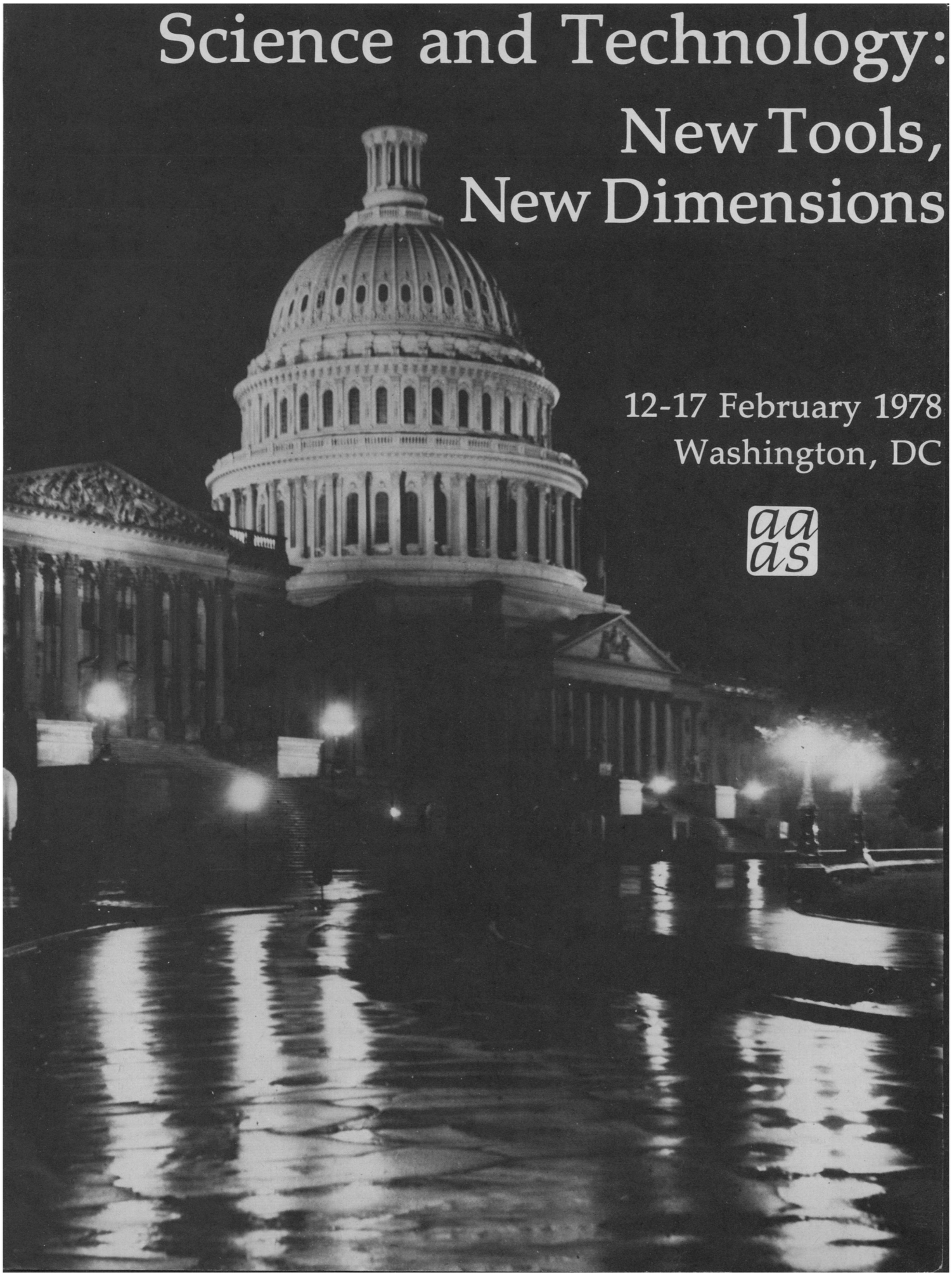
Employment Information Center

Adjacent to the exhibit area there will be bulletin boards for posting "positions wanted" and "positions open" notices. Also available will be small separated tables for conducting interviews. AAAS will not coordinate interactions between prospective employers and employees. **Hours:** 10 a.m.-6 p.m., 14-16 February.

Child Care Services

For meeting attendants who require baby-sitters for infants and small children, or companion care for children 8 years and up, we have obtained the services of the **Child Care Agency (phone: 202-783-8573)**. The agency is open Monday through Friday, 9:00 a.m. to 5:00 p.m.; 24 hours' notice is requested. All sitters are over age 21. **Rates:** The basic rate is $2.50 per hour (4 hours minimum) plus sitter's transportation cost.

Science and Technology: New Tools, New Dimensions



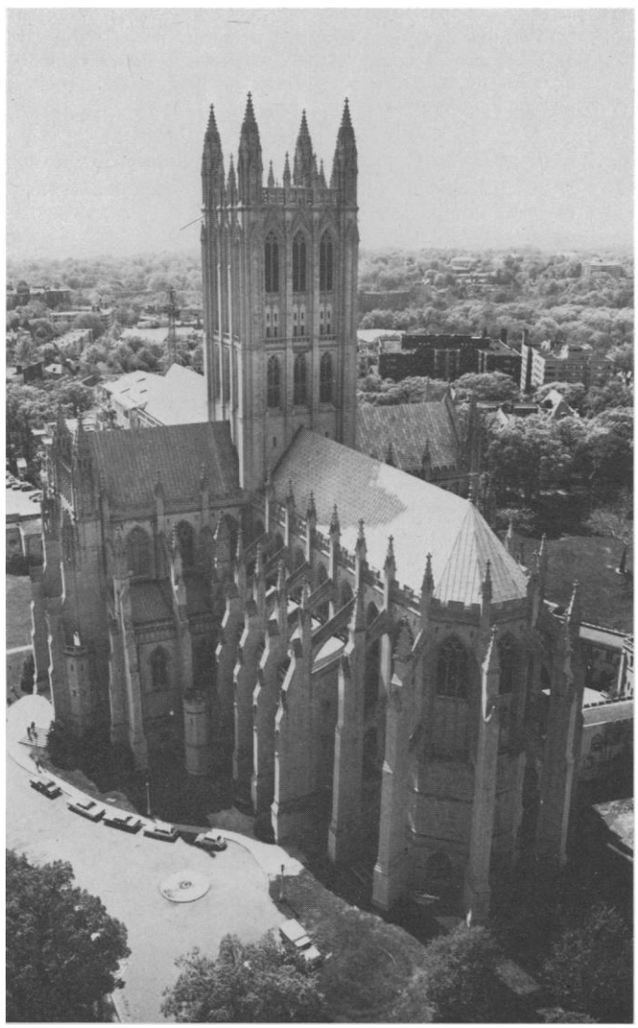
12-17 February 1978
Washington, DC

aaas

Science and Technology: New Tools, New Dimensions

Toolmaking is at least as old as mankind; many of us have seen the fanciful portrayal of its beginning in Kubrick's *2001: A Space Odyssey* with its juxtaposition of time past and time future. Whether or not we fully endorse Carlyle's "Man is a tool-using animal . . . without tools he is nothing, with tools he is all," the importance of toolmaking to human development cannot be denied. The skill of the toolmaker is at the very basis of our understanding of nature and our ability to control it. An important aspect of the Annual Meeting Program is the *Tools of Science*, consisting of a set of symposia and the Meeting exhibit, SCIENCE INTERNATIONAL, where the state of the art in scientific instrumentation will be displayed.

When the skill of the toolmaker is added to an abundant source of energy and the ability to harness it, technology bursts forth. Where technology might go is explored in the symposium, "Macroengineering Projects: The Infrastructure of Tomorrow," Energy sources and potential limits to technology from impending shortages are discussed in another set of symposia on *Energy*. Of course, resource limitations are not the only constraints on technological development; social and political considerations discussed in the sets of symposia on *Policy Development* and *Policy Issues*, as well as constraints on the scientific basis for technology, are also of great significance.



Washington Cathedral, the only Gothic cathedral currently under construction in the world. President Theodore Roosevelt laid the cornerstone in 1907 and the building is due for completion in the mid-1980's. [Washington Area Convention and Visitors Bureau]

The dimensions of science and technology as they develop and as they are perceived in the context of society, are a major concern of the Meeting Program. Not only do symposia consider the latest developments in the natural and social sciences, medicine, and engineering, but also the intrinsic limitations implicit in the *Methodology of Science* and the tradeoffs in scientific development implied by the tensions between *Scientific Freedom and Responsibility*. Many of these concerns are echoed in the ten featured Public Lectures ranging throughout the week of the Meeting.

In addition to the scientific program, there is the *Science Film Festival* and a series of scientific and guided cultural tours of the various laboratories, sights, and museums in the Washington area. Of special note is the exhibition "Aspects of Art and Science," to be opened at the National Museum of History and Technology at the time of the Meeting. Conceived by Cyril Stanley Smith of MIT and executed by Jon Eklund of the Smithsonian, the exhibition will trace how the needs of the artist and artisan have been a stimulus to our understanding of the nature of materials throughout the ages. We are indebted to Prof. Smith and Dr. Eklund for the development of this special feature and to PPG Industries, Inc. for sponsoring it. We are further indebted, for the many amenities which will grace the Meeting, to the Washington Advisory Committee, ably chaired by Gilbert M. Grosvenor and Robert R. Nathan.

Read through the material presented on the next few pages and assess for yourself the dimensions of our Meeting, then avail yourself of the tools on pages 56 and 57 and return these forms as soon as possible. Reserve your place early at this most important event and look forward to partaking in an experience which will expand your own intellectual dimensions.—ARTHUR HERSCHMAN

Annual Meeting
Washington
12-17 February 1978

For information on Tours and Cultural Events see *Science*, 20 January 1978.

Annual Meeting
Washington
12-17 February 1978

Preconvention Program

Science and Technology: New Tools, New Dimensions

Public Lectures

- **Co-Chairmen's Public Lecture (12 Feb., 8:30 p.m., SP).**
  Gilbert M. Grosvenor (Editor, *National Geographic* Magazine, Washington, D.C.).
  The Camera: The Third Eye of Science.

- **AAAS Public Lecture (13 Feb., 1:45 p.m., SP).**
  Dixy Lee Ray (Governor, State of Washington).
  Is Science the Public's Business?

- **AAAS Public Lecture (13 Feb., 8:30 p.m., SP).**
  Speaker invited.

- **Phi Beta Kappa Public Lecture (14 Feb., 1:45 p.m., SP).**
  Robert Jastrow (Director, Institute for Space Studies, NASA, New York, N.Y.).
  God and the Astronomers.

- **AAAS Public Lecture (14 Feb., 8:30 p.m.).**
  Philip Handler (President, National Academy of Sciences).
  Pangs of Science.

- **AAAS Public Lecture (15 Feb., 1:45 p.m., SP).**
  Robert C. Weaver (Distinguished Professor of Urban Affairs, Hunter College, City University of New York).
  The Impact of the New Deal and Participation in World War II Production upon Black Americans.

- **AAAS President's Public Lecture (15 Feb., 8:30 p.m., SP).**
  Emilio Q. Daddario (President, American Association for the Advancement of Science).
  Science and Its Place in Society.

- **AAAS Public Lecture (16 Feb., 1:45 p.m., SP).**
  Robert E. Marshak (President, The City College of the City University of New York).
  The Urban and Global Missions of American Higher Education.

- **AAAS Public Lecture (16 Feb., 8:30 p.m., SP).**
  Jearl Walker (Associate Professor of Physics, Cleveland State University).
  Night Flashes: A Multiple-Image, Multimedia Show for Science.

- **George Sarton Memorial Public Lecture (17 February, 1:45 p.m., SP).**
  I. Bernard Cohen (Professor of the History of Science, Harvard University).
  The Concept of Revolution in Science.

1. General Interest

The Frontiers of the Natural Sciences (13 Feb., SP): Biology, geothermometers, physics, chemistry, geometry, astronomy.
Rolf M. Sinclair, James A. Krumhansl, Thomas Eisner, Anita G. Harris, D. Allan Bromley, Norman Hackerman, Frederick J. Almgren, Jr., Frank D. Drake.

Recombinant DNA: Current Status of Regulatory Legislation (13 Feb., SP): Legislation at federal, state, and local levels.
Clifford Grobstein.

Blacks in Science, Medicine, and Invention (14 Feb., SA): Physicists, Carver to Hill, mathematics, biology and medicine, invention.
Ronald E. Mickens, Carl Spight, Joseph A. Johnson, III, Samuel P. Massie, James A. Donaldson, John M. Browne, Robert C. Hayden.

Sociobiology: Beyond Nature-Nurture (14 and 15 Feb., SP): New Synthesis, social organization, behavior, cultural determinants, male bias, hormones and gender, reproduction, sexual behavior, life-history characteristics, nepotism, kin selection, parent-offspring, natural selection, limitations of analysis, research, theory.
George W. Barlow, James Silverberg, David L. Hull, Stephen T. Emlen, John C. DeFries, Frank B. Livingstone, Stephanie A. Shields, Jane B. Lancaster, Elizabeth K. Adkins, George C. Williams, Richard Dawkins, Robert R. Warner, Jack W. Bradbury, Mary Jane West-Eberhard, Paul W. Sherman, William G. Irons, Napoleon A. Chagnon, Bobby Joe Williams, Judy A. Stamps, Robert A. Metcalf, Margaret Mead, Stephen J. Gould, David P. Barash, Eleanor Leacock, Edward O. Wilson, Arthur L. Caplan.

Science and the Science-Fiction Writer (15 Feb., SA):
Rolf M. Sinclair, Ben Bova, David Gerrold, Frank Herbert.

Participation of Women and Men in Scientific Research (15 Feb., SP): Data, experiences, sociological variables.
Michele L. Aldrich, William D. McElroy, Betty M. Vetter, Virginia Walbot, Cora Marrett, Charles Odegaard, Carlos Kruytbosch.

HOTEL CODES: Sheraton-Park . . . . . SP; Shoreham Americana .SA

AAAS Awards Session (15 Feb., SP): AAAS-Newcomb Cleveland, AAAS Socio-Psychological, AAAS-Rosenstiel.

Genes and Gender (16 Feb., SP): Primates, animal versus human, aggression, brain asymmetry, transsexualism.

Ruth Hubbard, Marian Lowe, Lila Leibowitz, Ruth Bleier, Freda Salzman, S. Leigh Star, Janice G. Raymond.

Risk Assessment Using *E. coli* for Recombinant DNA Techniques (16 Feb., SP): Host-vector systems, NIH guidelines, legislative regulation.

Clifford Grobstein, Sherwood L. Gorbach, Roy Curtis III.

Stress (17 Feb., SP): Determinants of control, coronary disease, job loss, somatic illness, helplessness, depression.

Jerome E. Singer, Barbara S. Dohrenwend, David C. Glass, Stanislav V. Kasl, Sidney Cobb, John W. Mason, Hans Selye, Richard S. Lazarus, Martin E. Seligman, Suzanne Miller, Jay M. Weiss.

2. Energy

The Impact of the Geosciences on Critical Energy Resources (13 Feb., SA): Federal objectives, university programs, hydrocarbon, coal, geothermal, nuclear, environmental impact.

C. A. Burk, C. L. Drake, Harrison H. Schmitt, Peter T. Flawn, J. D. Moody, Jack A. Simon, W. L. Fisher, Leon T. Silver, Priscilla C. Grew.

Efficient Comfort Conditioning (Heating and Cooling) of Buildings (13 Feb., SP): Solar, OTA evaluation, market acceptance, economic analysis, storage, cogeneration, community systems, load management, community storage, urban areas, HUD experience, Sweden.

Walter G. Berl, W. Richard Powell, Frederick H. Morse, Henry Kelly, Gerald E. Bennington, Peter C. Spewak, Robert T. Crow, J. G. Asbury, J. V. Caruso, R. S. Giese, Ronald O. Mueller, Karl W. Böer, Gerald S. Leighton, Robert G. Uhler, James R. Powell, Jerome H. Rothenberg, Lee Schipper.

The Socioeconomic Impacts of Energy Development (13 Feb., SP): Social impacts, Western energy development, boomtown, nuclear.

Frank Clemente, Stan L. Albrecht, Ronald L. Little, William R. Freudenburg, Richard S. Krannich.

New Batteries in Energy Use of the Future (14 Feb., SP): Ionic transport, sodium-sulfur, lithium-titanium disulfide, load leveling.

Reuben S. Title, Robert von Gutfeld, Robert A. Huggins, Walter L. Roth, Robert P. Hamlen, Lewis H. Gaines, James R. Birk.

Economic Growth With/Without Energy Conservation (14 Feb., SP): Imperative of conservation, full employment, economic well-being, GNP, post-petroleum prosperity, capital stock.

Charles J. Hitch, John H. Gibbons, Chauncey Starr, Walt W. Rostow, Joel Darmstadter, Mike McCormack, Denis Hayes, Alan S. Manne, Roger W. Sant.

Renewable Energy Resources: Modeling of Complex Realities (14 Feb., SP): Tidal power, wind energy, economic growth, potential markets.

Maxine L. Rockoff, Edward H. Blum, George F. D. Duff, Marvin R. Gustavson, William W. Hogan.

The Report of the National Academy of Sciences' Committee on Nuclear and Alternative Energy Systems (15 Feb., SP): Demand and conservation, alternative supply, energy modeling, risks and impacts, nuclear energy.

Harvey Brooks, Edward L. Ginzton, Jack M. Hollander, John H. Gibbons, W. Kenneth Davis, Floyd L. Culler, Jr., Lester B. Lave, Tjalling C. Koopmans, James Crow, John Harte, David Sills, Bernard I. Spinrad, David Rose, John P. Holdren.

Exploring a Rationale for Long-Term R&D Investments in Inexhaustible Energy Resource Technologies (16 Feb., SP): Solar, federal role, timing and selection, global context, technology investments.

Robert Nathans, Allen L. Hammond, Stephen Rattien, Robert L. Hirsch, James W. Howe, Bennett Miller.

Life-Cycle Costing in Energy Conservation (16 Feb., SP): Conversion technologies, zero growth, transportation, procurement methods, industrial processing, realistic goals.

S. S. Penner, John A. Belding, Eric Hirst, Henry L. Stadler, N. B. McEachron, D. C. Hall, L. F. Lewis, T. V. Long, John H. Gibbons.

Federal Energy Policies: Future Directions (17 Feb., SP): Energy goals, nuclear policy, international perspective, research and development.

John C. Sawhill, Frank Zarb, Joseph S. Nye, Melvin Conant, Robert Fri.

3. Tools of Science

Photography and Imaging as Tools of Science (13 Feb., SP): CT scanning, non-invasive dissection, radionuclide imaging, angiography, videotape in medicine, pediatric endoscopy, polar oceans, deep sea research, the monitor, space technology, high-speed photography, holography.

W. E. Garrett, Bryan Hodgson, Julie Gamble, John M. Keshishian, David O. Davis, Richard A. Robb, Nicholas G. Nolan, H. Brandis Marsh, Hans H. Schneider, Stephen L. Gans, Timothy W. Kennedy, Joseph B. MacInnis, Robert D. Ballard, Emory Kristof, Harold E. Edgerton, Robert E. Kutzleb, James R. Edberg, Gregory A. Dale, David R. Scott.

Computers as Tools in Science (14 Feb., SP): Intelligent instruments, languages, neurobiology, the future, pattern recognition, synthesis, diagnostic cytologies, data base management.

Raymond E. Dessy, James T. Arnold, Howard Moraff, Paul B. Brown, Richard Case, Peter C. Jurs, W. Todd Wipke, Peter H. Bartels, George L. Wied, Martha Williams.

New Tools for Viewing the Universe (15 Feb., SP): Optical, infrared, and space telescopes; radio astronomy; x-ray.

Beverly T. Lynds, Morton S. Roberts, William E. Howard, III, Leo Goldberg, Charles H. Townes, David S. Heeschen, Noel W. Hinners, Lyman Spitzer, Jr., Edwin M. Kellogg.

Patterns of Invention (16 Feb., SP): Cyclotrons, maser, laser.

Rolf M. Sinclair, M. Stanley Livingston, Charles H. Townes.

The New Ion Microscopies: Progress and Prospects (16 Feb., SP): Proton microprobe, high resolution, secondary-ion microprobe.

Walter L. Brown, Paul Horowitz, Riccardo Levi-Setti, George R. Ringo.

Mathematics: Tool of Science (17 Feb., SP): Physical sciences, life sciences, industrial setting, undergraduate program.

Alfred B. Willcox, Peter D. Lax, Robert M. May, Gordon Raisbeck, Maynard D. Thompson.

Research Reporting with Tomorrow's TV and Computer Graphics (17 Feb., SP): Visual literacy, interactive telecommunication, computer-to-computer communication.

David Triantos, Frederick R. Broome, Lawrence E. Cornish, Francis M. Dwyer, Peter Clarke, Martin Elton, S. Joseph Campanella, Richard Maynard, Bruce Cornwell, James Johnson, Murray Turoff, S. Roxanne Hiltz.

4. Engineering and Technology

Macroengineering Projects: The Infrastructure of Tomorrow (13 Feb., SP): Historical perspectives, the environment, model neighborhood, planning, finance, the oceans, transplanetary subway systems, solar power satellites, asteroid capture.

Frank P. Davidson, Lawrence J. Giacoletto, Robert Salkeld, Eugene S. Ferguson, Howard Margolis, Frank Laird, Peter Land, Richard Godwin, W. Kenneth Davis, Wallace O. Sellers, Louis E. Alfeld, Mel Horwitch, George Kozmetsky, Brian N. Quickstad, Charles J. Ryan, J. Vincent Harrington, Robert M. Salter, Peter E. Glaser, Brian T. O'Leary, Philomena G. Grodzka, A. Ranger Curran, David Fromkin, William J. Jones, Philip J. Pocock, A. George Schillinger, Ellis L. Scott, Michael Telson.

Hypergraphics: Visualizing Complex Relationships in Art, Science, and Technology (14 Feb., SP): Applied science, four-dimensional geometry, visual comprehension, N-dimensional geometry.

David W. Brisson, Steve M. Slaby, Thomas F. Banchoff, Charles M. Strauss, Gregg Edwards, Cyril Stanley Smith.

Corrosion: The Silent Scourge (14 Feb., SP): Societal consequences, museum research, economic effects, corrosion research, corrosion technology.

William R. Prindle, Roger W. Staehle, Martha Goodway, Elio Passaglia, Jerome Kruger, M. Brian Ives.

Appropriate Technology: Panacea for Developing Nations? (15 Feb., SP): A Mexican community, agricultural colleges, development, U.S.A.I.D.

Katrina L. Eadie, David G. Cartano, Cynthia Hewett de Alcantara, Milton Morris, A. Eugene Havens, Reed Hertford, Witold Rybczynski, Mastin Piñeiro.

Effects of Changing Social Priorities on Engineering and Technology in the United States and Abroad (16 Feb., SP): Consumer, university, opportunities for technology, global politics, developing countries, engineering schools.

George Bugliarello, A. George Schillinger, Lewis M. Branscomb, William F. May, William Linvill, Edward Wenk, Jr., N. Bruce Hannay, Harlan Cleveland, Richard S. Eckaus, Robert P. Morgan.

The Role of Technology in Changing the International Economic Order (17 Feb., SP): World economy, automotive industry, energy, electronics, Atlantic community.

Jack Baranson, Christian N. Kristoff, Edward J. Gornowski, John B. Arnold, John H. Hoagland, Sergio C. Trindade, Makarand V. Dehejia.

Appropriate Technology in the Developed Countries: The Macro and Micro Sides of It (17 Feb., SP): Developing nations, the environment, structural basis, farm equipment, low-income people, chemicals.

Allen Jedlicka, Robert M. Pierson, John F. Seiberling Jr., Beth Hagens, Gordon H. Millar, James Schmidt, William R. Nummy, Thomas H. Fox, John F. Clark, Joseph F. Coates, Steven Palincsar, William R. Ludka.

5. Physical Sciences

Gravitational Physics—A New Window for Exploration (13 Feb., SP): Gravitational wave, gravitational interaction.

William O. Hamilton, Joseph Weber, Kip S. Thorne, Irwin S. Shapiro, Carroll O. Alley, L. S. Cutler, R. A. Reisse, R. E. Williams, J. D. Rayner, C. A. Steggerda, J. V. Mullendore, S. Davis, L. Small.

Progress in X-ray Astronomy—First Results from HEAO-1 (13 Feb., SP): X-ray sky, diffuse component, optical and radio counterparts, high energy.

Herbert Gursky, Frank B. McDonald, Herbert Friedman, Elihu A. Boldt, Laurence E. Peterson, Wallace L. W. Sargent.

The Search for Extraterrestrial Intelligence: Priority or Pandora's Box? (14 Feb., SP): Astronomical perspective, life in the universe.

Alan M. Ladwig, Leonard W. David, Richard Berendzen, Carl Sagan, Richard Young.

Humans in the Cosmos (15 Feb., SA): Sun and climate, orbital variations, interstellar dust clouds, supernovae.

Gerrit L. Verschuur, J. Murray Mitchell, Jr., James D. Hays, Raymond J. Talbot, Jr., Malvin A. Ruderman.

Prospects for Life in the Universe: The Ultimate Limits to Growth (15 Feb., SA): Industrialization of space, space settlement, long-term growth, intelligent life.

William A. Gale, Jesco von Puttkamer, Brian T. O'Leary, Freeman J. Dyson, Gregg Edwards, Carl Sagan, Michael Michaud.

Picosecond Lasers in Chemistry (16 Feb., SP): Radiationless processes, bacterial photosynthesis, electronic relaxation, radiation chemistry, exciton migration and annihilation.

Kenneth B. Eisenthal, William Spindel, Norman Metzger, Charles V. Shank, E. P. Ippen, Maurice W. Windsor, Dewey Holton, Peter M. Rentzepis, John W. Hunt, Stanley L. Shapiro, A. J. Campillo.

Science for the Naked Eye: Or the Physics of Everyday Experience, V (17 Feb., SP): Lasers and art, insect's view, earth from above, karate, before Columbus, moving about.

Rolf M. Sinclair, Stephen A. Benton, Thomas Eisner, Georg Gerster, Michael S. Feld, Ron McNair, David Feld, Jonathan Feld, Anthony F. Aveni, Vance A. Tucker.

6. Climate and Land Use

Impacts of Recent Weather Extremes in the United States (13 Feb., SA): Recent drought, 19th century precedents, cold winter, water resource problems, agriculture.

J. Murray Mitchell, Jr., Donald L. Gilman, David M. Ludlum, Norton D. Strommen, Ronald B. Robie, Phillip F. Sisson.

The Scientific Basis of Modern Weather Forecasting (13 Feb., SA): Physical methods, statistical methods, benefits to the public, atmospheric modeling, prediction.

Frederick G. Shuman, Norman A. Phillips, Cecil E. Leith, George P. Cressman, Joseph Smagorinsky, Edward N. Lorenz.

Hail Suppression, Impacts, and Issues: A Technology Assessment (14 Feb., SA): Economic impact, future research, policy issues.

Barbara C. Farhar, Stanley A. Changnon, Jr., C. Robert Taylor, Jon van Blokland, Steven T. Sonka, Dean E. Mann.

Remote Sensing Applied to Meteorology and Hydrology (14 Feb., SA): Ground-based, numerical models, satellite and radar data.

David S. Johnson, C. Gordon Little, Verner E. Suomi, Vincent J. Oliver, Vincent V. Salomonson, Eugene L. Peck, Donald R. Wiesnet.

Whither LANDSAT? Future Directions for Earth Observation Data Management Systems (15 Feb., SA): Environmental information, industry's view, remote sensing, economics and policy.

Lester F. Eastwood, Jr., Christopher T. Hill, Daniel P. Fink, A Donald Goedeke, Charles K. Paul, Robert P. Morgan.

Desertification: Issues in Measuring and Monitoring the Process with Indicators (15 Feb., SA): Plant species, social indicators, developed economies, Mexican experiment.

Priscilla Reining, Elinor Terhune, Brian Spooner, John W. Bennett, Martin H. Gonzalez.

Assessing Natural Resources: Science, Land Use, and Public

Policy (16 Feb., SA): Great Britain, states survey, Canada, U.S. Geological Survey, power plants, mine reclamation, irrigation survey, floods, dams, San Francisco, Connecticut.

James R. Balsley, Harold L. Burstyn, Ellis Y. Yochelson, Douglas A. Bassett, Michele L. Aldrich, Morris Zaslow, Henry W. Coulter, Edgar A. Imhoff, John Alexander Williams, Donald M. Thomas, Robert D. Brown, Hugo Thomas.

Climatic Futures (17 Feb., SA): Climatic fluctuations, limits to growth, prediction, models, geological record.

Robert M. White, Helmut E. Landsberg, Stephen H. Schneider, Syukuro Manabe, John Imbrie, Reid A. Bryson.

7. Biological Sciences

The Physiology of Ions in Muscle and Other Cells (13 Feb., SP): Donnan theory, extracellular osmolarity, developing tissues, muscle fibers, nonosomotic water, contractile dynamics, cardiac myofilaments, reticulum membrane, calcium movement, muscle contraction.

Mary E. Clark, Giuseppe Inesi, Paul J. Paolini, Joseph A. M. Hinke, Robert W. Freel, Carlton F. Hazlewood, Arthur K. Solomon, F. Norman Briggs, John Solaro, Richard J. Podolsky, Elizabeth W. Stephenson, Martin F. Schneider, P. Horowicz.

Some Mathematical Questions in Biology (14 Feb., SA): Random models, optimization models, musical perception, stochastic problems, pattern formation, immune response.

Simon A. Levin, George Oster, Stephen J. Gould, Christopher Longuet-Higgins, Jack D. Cowan, Joseph B. Keller, Peter H. Richter, Alan S. Perelson.

Recombinant DNA, Public Health, and Biomedical Research Policy (15 Feb., SP): Virulence, epidemiology, antibiotic resistance, workers view, industrial hazards, ethics, environmental protection, legislative problem.

Jonathan A. King, Halsted Holman, Richard Novick, George Wald, Luther Williams, Claire Sullivan, Anthony Mazzocchi, Sheldon Krimsky, Ann Neale, Francine Simring, Richard Ottinger, Albert Wheeler, Susan Wright.

A Cold Look at the Warm-blooded Dinosaurs (16 Feb., SP): Endothermy, population structure, parietal-pineal complex, living reptiles, thermoregulation.

Roger D. K. Thomas, Everett C. Olson, John H. Ostrom, Robert T. Bakker, Jan J. Roth, Neil Greenberg, Nicholas Hotton.

Biological Transformations of Inorganic Nitrogen (17 Feb., SP): Fixation, needs of crops, soil-plant systems, denitrification, micro-organisms, world needs.

Wilbur H. Campbell, R. W. F. Hardy, W. J. Payne, E. L. Schmidt, James M. Tiedje.

Threatened and Endangered Species (17 Feb., SP): Legislation, international efforts, ecological stability, economics, conservation and management.

Donald J. Zinn, Michael E. Berger, Patsy T. Mink, Richard W. Dyer, Charles Warren, John Spink.

8. Agriculture and Food

Nutrition and Agriculture: Strategies for Latin America (13 and 14 Feb., SP): World study, strategies in tropics, Amazon program, agroindustries, Yugoslav experience, vertically integrated agroindustry, Peruvian experience, nutrition planning, Colombian experience, Asian cases, NAS study, case of Chile, research collaboration, malnutrition problems.

Joel Bernstein, Teresa Salazar de Buckle, Miguel Jimenez, D. Gale Johnson, Eduardo Alvarez Luna, Rodolfo Moreno Dahme, Martin E. Piñeiro, Charles H. Wood, Marianne Schmink, Sterling Wortman, Almiro Blumenschein, Ernesto Cruz, Edward Pastucha, Alexander Grobman, Juan Sala, Raymond Goldberg, Agide Gorgatti Netto, Tomas Uribe, David Gwatkin, Sol H. Chafkin, Martin Forman, Giorgio Solimano, Peter Hakim, Robert Klein, Antonio Carlos Campino, Werner Jaffe, Victor Horcasitas, Benjamin F. Buchanan, Harrison Brown, Theresa Tellez Brown, Peter R. Jennings, Jackson A. Rigney, Jose E. Araujo Goncalves.

Food Production and Energy: Present Status and Future Alternatives (14 Feb., SP): Energy use, needs, resources, fuels, engines.

Bill A. Stout, Bruce A. McKenzie, Earle E. Gavett, Gary H. Heichel, William C. Burrows.

Future Production and Consumption of Meat (15 Feb., SP): Production without grain, genetic improvement, value of meat, residues, saturated and unsaturated fats.

Clair E. Terrill, C. Wayne Cook, Gordon E. Dickerson, P. Vincent J. Hegarty, Thomas H. Jukes, Raymond Reiser.

The Question of Meat (15 Feb., SP): Nutrition, health, economic, ethical cases for and against.

Alex Hershaft, George V. Mann, John A. Scharffenberg, Richard E. Lyng, James B. Mason, Carol T. Foreman.

New Agricultural Crops (16 Feb., SP): Ancient crops, guayule, winged bean, jojoba.

Gary A. Ritchie, Richard S. Felger, Noel D. Vietmeyer, Christine A. Newell, Theodore Hymowitz, LeMoyne Hogan.

Public Support for Agricultural Research and Extension Education: Evaluation of Benefits from Public Investments (16 Feb., SP): Issues and priorities, funding obstacles, returns to investment, projections of productivity.

B. R. Eddleman, James Nielson, J. B. Cordaro, Willis L. Peterson, Yao-Chi Lu.

Pesticides: Role in Agriculture and the Environment (17 Feb., SP): Increasing and stabilizing production, socioeconomic impacts, energy utilization, the environment, human health, pest management.

David Pimentel, T. J. Sheets, Fred H. Tschirley, Gerald A. Carlson, Eddy L. LaDue, John H. Berry, John L. Buckley, William F. Durham, L. D. Newsom.

9. Medicine and Health

Prevention of Genetic Disease and Developmental Disabilities (13 Feb., SA): Screening, heterozygote experience, alpha-1-antitrypsin deficiency, Duchenne muscular dystrophy, chromosomal disorders, neural tube defects, hemoglobinopathies.

Tamah L. Sadick, Siegfried M. Pueschel, Barton Childs, Robert Guthrie, Charles R. Scriver, Richard C. Talamo, Marie-Louise E. Lubs, Cecil B. Jacobson, Aubrey Milunsky, Maurice J. Mahoney, David G. Nathan.

Social Acceptance of Preventive Dentistry Programs (14 Feb., SA): Programs in United States and abroad, economic analysis, social factors.

Donald B. Giddon, Richard D. Mumma, Jr., Myron Allukian, Jr., Paul J. Feldstein, Albert F. Wessen, Stephen F. Kegeles, John C. Greene.

Pharmacology on the Firing Line (14 Feb., SA): Current role, human research, cancer therapies, Delaney amendment, addictive disorders.

Lowell M. Greenbaum, Sorell L. Schwartz, Joseph R. Bertino, John Doull, Jerome H. Jaffe.

Assessing the Contributions of the Social Sciences to Health (15 Feb., SA): Demographic methods, health and fertility, industrialization, political and economic organizations, medical education, cultural and environmental factors, psychosocial factors, health services.

M. Harvey Brenner, John Radcliff, Nathan Keyfitz, John F.

Kantner, Peter Kong-Ming New, Jude T. May, Ellen Greenberger, Stanley J. Reiser, Nancie L. Gonzalez, William Schofield, James R. Greenley.

Solving the Riddle of Cancer: Role of the Physician (16 Feb., SA): Alert physician, skilled observer, basic scientist, multidisciplinary approach.

Albert B. Lowenfels, Thomas S. Cottrell, Joseph F. Fraumeni, Jr., Judah Folkman, John H. Weisburger.

Statistics and Environmental Factors in Health (16 Feb., SA): Workers exposed to ionizing radiation, carcinogenic risk, carcinogen bioassay data.

Alice S. Whittemore, Ethel S. Gilbert, Ronald E. Wyzga, David G. Hoel, Kenneth C. Chu, Bernard Altshuler, Lincoln E. Moses.

10. Behavioral Science

The Relationship Between the Health-Care Environment and Human Behavior (13 Feb., SA): Color in medical facilities, innovations in design, less stressful environment, recycling hospital space.

Devra Lee Davis, Brian Pierman, Alexander F. Styne, Gloria Weissberg, Peter Bourne, Aristide H. Esser, Larry Plumlee, Vilma Hunt, Lorenz K. Y. Ng.

Language Rehabilitation in Aphasia: An Examination of the Process and Its Effects (13 Feb., SA): Speech and language therapy, behavioral events, communicative ability, melodic intonation therapy.

Christy L. Ludlow, Robert T. Wertz, Robert H. Brookshire, Audrey Holland, Nancy A. Helm.

Brain and Behavior: Mechanisms of Perception, Learning, Memory, and Attention (14 Feb., SA): Visual system, cortical mechanisms, tecto-pulvinar system, eye movements, volitional movement, directed attention, focal brain lesions, memory disorders.

Donald B. Lindsley, Leo M. Chalupa, Robert W. Rhoades, James M. Sprague, Mark A. Berkley, Irving T. Diamond, Robert H. Aurtz, Edward V. Evarts, Vernon B. Mountcastle, Norman Geschwind, Marek-Marsel Mesulam, Brenda A. Milner.

New Light on Leadership Processes (15 Feb., SA): Leadership training, role-making processes, dynamics, path-goal and charismatic theories.

Edwin P. Hollander, Edwin A. Fleishman, Martin M. Chemers, George Graen, Robert J. House, Martin G. Evans.

Executive Development and Stress from the Psychoanalytic Point of View (15 Feb., SA): Developmental roots, executive functioning, maternal identification.

Louis A. Gottschalk, Gene Gordon, Albert J. Solnit, George H. Pollock, James Barber, Reginald Lourie, Thomas E. Bryant.

Humanization of Assessment: A Cybernetic Approach to Mental Health (16 Feb., SA): Human resource development, information systems, conceptual complexity, family therapy, program evaluation.

Mark N. Ozer, Frank Baker, Harry P. Cain, Curtis P. McLaughlin, Eugene Laska, Edward J. Kelty, Mary Davis Moore, William Hogg, Murray Levine.

Culture and Science: Comparative Receptions of Psychoanalysis in Western Countries (17 Feb., SA): Germany, France, England, the Netherlands, Spain.

John C. Burnham, Hannah S. Decker, Nathan G. Hale, Stephen Y. Wilkerson, Ilse N. Bulhof, Thomas F. Glick.

Cocaine (17 Feb., SA): History, medicines, neurophysiological models of psychosis, federal policy, drugs and culture.

Lester Grinspoon, David F. Musto, Andrew T. Weil, Robert M. Post, Peter G. Bourne, James B. Bakalar.

11. Human Development and Habitation

Aging from Birth to Death (13 Feb., SA): Cognitive and intellectual functioning, stressful events, social support, the life cycle, sources of change, transition to adulthood, demographic change, inflation, unemployment, aging in America.

Matilda White Riley, Paul B. Baltes, Sherry L. Willis, Melvin L. Kohn, Carmi Schooler, Bruce P. Dohrenwend, John M. De Figueiredo, Robert L. Kahn, Sidney Cobb, Anne Foner, David I. Kertzer, Halliman H. Winsborough, Peter Uhlenberg, James N. Morgan, Theodore J. Gordon.

Emotional Development in Infants (14 Feb., SA): Emerging models, maternal behavior, perception, cognition and emotion.

David Pearl, Robert N. Emde, Mary D. Salter Ainsworth, Joseph J. Campos, L. Alan Sroufe, Richard Q. Bell.

The Life Cycle: Development in the Middle Years (14 Feb., SA): Post-parental, personality development, mid-life transition.

Daniel J. Levinson, Robert A. LeVine, David L. Gutmann, Florine B. Livson.

The Extended Family in the Postindustrial Society (16 Feb., SA): 21st century, the market and the budget, household school, familiar groups.

David P. Snyder, Carol Stack, Kenneth E. Boulding, Winifred I. Warnat, Gregg Edwards, Margaret Mead.

Families in the Metropolis: Emerging Concerns in Urban Housing (16 Feb., SA): Housing quality, publicly assisted housing, preference and selection, quality of family life.

Harvey M. Choldin, Sandra C. Howell, Sue Weidemann, Guido Francescato, James R. Anderson, Amos Rapoport, Patricia Klobus-Edwards, John N. Edwards, Alan Booth.

The Aged in Families (17 Feb., SA): Perspectives on caring, historical role, aged parents, federal role.

Norman Metzger, Robert N. Butler, David F. Musto, Jane Otten, Robert M. Ball.

12. Anthropology

The Viability of the Village in Contemporary Society (13 Feb., SA): Middle East, India, Southeast Asia, human development, Sahelian, Hungarian, renewable energy, education.

Priscilla Reining, Barbara Lenkerd, Daniel G. Bates, Charlotte V. Wiser, Clive Bell, Michael Maccoby, Francis P. Conant, David Shear, Conrad C. Reining, James W. Howe, John Simmons, Margaret Mead.

Fertility Decline in the Less-Developed Countries: The Emerging Patterns (14 Feb., SA): Quantitative analysis, historical perspective, middle-class and poor, health programs and fertility, People's Republic of China, government policy, population, food intake, child rearing, income distribution.

Nick Eberstadt, W. Parker Mauldin, Maris H. Vinovskis, Nathan Keyfitz, Susan C. M. Scrimshaw, Richard Tabors, John Aird, William Petersen, Rose E. Frisch, Moni Nag, Robert C. Repetto.

Keystones of Culture: The Discovery of Culturally Specific Behavior Patterns Through Research Film Analysis (15 Feb., SA): Phenomenological inquiry, visual data, Pashtoun society, Canela Indian, Micronesia.

E. Richard Sorenson, William H. Crocker, Asen Balikci, Steven C. Schecter, M. Michael Maloney.

Emergence of Language: Continuities and Discontinuities (16 Feb., SA): Comparative psychology, sign language, neural mechanisms, man and animals.

Stewart H. Hulse, A. Noam Chomsky, William C. Stokoe, Doreen Kimura, Beatrice T. Gardner, R. Allen Gardner.

An Account of the Auditory Mode: Man versus Ape (16 Feb.,

SA): Ephemerality, do apes talk, sound and thought, spoken word.
Frank E. X. Dance, William Work, Ralph B. Thompson, Philip Lieberman, Walter J. Ong.

Public Anthropology (17 Feb., SA): Development, social impact, federal government, archeological experience.
Bela C. Maday, Laura Nader, D. Glynn Cochrane, John H. Peterson, Sue-Ellen Jacobs, Lucy M. Cohen, Charles R. McGimsey III, Peter Kong-Ming New.

Indians of the Eastern United States (17 Feb., SA): Integrity and continuity, federal relationship, other Indians, Non-Indian neighbors, injustice.
Sam Stanley, Robert K. Thomas, Stephen Feraca, Vine Deloria, Jr., John Stevens, Susan Stevens, Thomas Tureen, Sol Tax.

13. Methodology of Science

The Role of Models in Scientific Inquiry (13 Feb., SA): Theoretical physics, geology, economics.
Ernan McMullin, Robert S. Cohen, Charles W. Misner, David B. Kitts, Edward J. Nell.

Can Mathematics Be Applied to the Social Sciences? (14 Feb., SA): Computer models, economics, social theories, structure of mathematics, outside the natural sciences, critical theory, problem of meaning.
Sanjoy K. Mitter, Héctor J. Sussmann, Joseph Weizenbaum, Pravin Varaiya, David Berlinski, Roger W. Brockett, Thomas A. McCarthy.

Mathematical Models of Information Systems (15 Feb., SA): Calculus and value of information, uncertain decision, software engineering.
Andrew Vazsonyi, William T. Ziemba, Harlan D. Mills.

Limits on Scientific Progress (16 Feb., SA): Controversies, completeness, limits of growth, limits of science.
Nicholas Rescher, Eugene P. Wigner, Laurens Laudan, Richard Schlegel, Mario Bunge.

The Reception of Unconventional Science by the Scientific Community (16 Feb., SA): Acausality, continental drift, acupuncture parapsychology.
Seymour H. Mauskopf, Paul Forman, Henry R. Frankel, John Z. Bowers, Marcello Truzzi.

Replicability and Experimenter Influence (17 Feb., SA): Quantum mechanics, behavioral and parapsychological research, replicability, scientific method.
Charles Honorton, Irvin Child, Henry Margenau, Robert Rosenthal, Harry M. Collins.

The Rhetoric and Language of Science (17 Feb., SA): Implied audience, technology, neutral description.
Berel Lang, Arthur Quinn, J. C. Mathes, Gary H. Stahl, Bernard Kaplan.

14. Scientific Freedom and Responsibility

Appraising Peer Review (13 Feb., SA): NIH, citation data, NSF.
Harriet Zuckerman, Ruth L. Kirschstein, Grace M. Carter, Stephen Cole, Jonathan R. Cole, Felix Chayes.

Participation and Expertise in a Democratic Society (13 Feb., SA): Citizens court, science court, political actor, federal agencies, European countries.
Dorothy W. Nelkin, Sheldon Krimsky, Allan C. Mazur, Jerome E. Milch, Daniel S. Metlay.

Science and the "Isms" of the 20th Century (14 Feb., SA): Marxism, fascist state, Nazi Germany, Kapitza and Sakharov.
Robert E. Filner, Derek de Solla Price, Judith R. Goodstein, Alan D. Beyerchen, Lawrence Badash, Robert S. Cohen.

Whistle-Blowing and Scientific Responsibility: The Management of Technical Dissent (15 Feb., SA): Regulatory agencies: FDA, HEW, NRC; administrator's congressional and reviewer's perspective; nuclear safety; scientific dissent.
Frank von Hippel, Rosemary A. Chalk, Harold P. Green, Carol S. Kennedy, Marc Novitch, Lawrence C. Horowitz, Norman Dorsen, H. Bentley Glass, Ronald M. Fluegge, Roger J. Mattson, Henry R. Myers, Robert J. Baum, Jeremy J. Stone.

Regulation of Scientific Inquiry: Societal Concerns with Research (16 Feb., SA): Need for regulation, ethical dilemmas, value conflicts, secrecy and the individual, privacy regulations, human subject, accountability and power.
Hans O. Mauksch, Rosemary A. Chalk, Keith M. Wulff, André E. Hellegers, Barry M. Casper, Kurt W. Back, Lee N. Robins, Albert J. Reiss, Jr., Harold P. Green, Eliot Freidson.

Human Rights and Scientific Freedom: Are Scientists Special? (17 Feb., SA): Human issues, Argentina, Soviet scientists, congressional activities.
John T. Edsall, Joel R. Primack, Robert W. Kates, Mark S. Mellman, Robert F. Drinan.

15. Education and Opportunities

Issues in Science Education (13, 14 and 15 Feb., SP): Public education, impact of legislation, policies, NSF curriculum programs, research.
James T. Robinson, Arthur H. Livermore, Herbert A. Smith, Harold L. Hodgkinson, F. James Rutherford, Fletcher G. Watson, James W. Symington, Lester G. Paldy, Robert W. Howe, David H. Ost, Robert L. Silber, Thomas A. Shannon, Donald Barr, Fenwick W. English, J. Dudley Herron, Rodger W. Bybee, Robert E. Stake, Beth K. Dawson, Iris R. Weiss, Wayne W. Welch, Marjorie H. Gardner, Stanley L. Helgeson, James G. Greeno, Laura Nader, Mary Budd Rowe.

New Trends in Interpreting Science to the Public (14 Feb., SP): Daily newspaper, newsletter, magazine, television, radio.
Eugene H. Kone, George Alexander, Daniel S. Greenberg, Peter Gwynne, Robert Bazell, Ira Flatow.

Meeting Educational Needs Through Broadcasting Satellites (14 Feb., SP): NASA satellites, regional medical education, graduate level and continuing education, Appalachian, public services.
Frank W. Norwood, Wasyl M. Lew, Patricia I. Boyce, M. Roy Schwarz, Marion H. Johnson, Kenneth S. Down, Harold E. Morse, John P. Witherspoon.

Communication with Science's Publics: Prerequisite to Public Support (14 Feb., SP): Interpersonal linkage, changing perceptions, scientific hubris, consumers, reporters and the establishment.
Harold F. Osborne, Philip H. Abelson, Albert Rosenfeld, Alton L. Blakeslee, Lewis Thomas, Michael J. O'Neill.

Early Intervention: Matching Programs to Children (15 Feb., SP): Delivery systems, long-range effects, preschool attendance.
Bernard Brown, Irving Lazar, Ruth V. Hubbell, Ira Gordon, David P. Weikart, Francis H. Palmer, Shirley G. Moore.

Culturally Based Science Education: Needs and Strategies for Science Literacy (15 Feb., SP): Ethnoscientific approach, Appalachian, Latin American and American Indian education, Northern Plains Indian.
Rayna D. Green, Eliot Wigginton, Ubiratan D'Ambrosio, Alan Goodman, Mary E. Bluemle.

Civil Rights of the Handicapped: Access to Higher Education

(16 Feb., SP): 504 regulations, services, alterations of facilities, enforcement.

Jack Martin, Wayne E. Fortunato-Schwandt, Roger R. Revelle, Pat Marx, Ronald L. Mace, John Wodatch.

Post-High School American Youth—Results from Analyses of the National Longitudinal Survey of the High School Class of 1972 (16 Feb., SP): Postsecondary education, work, female participation, financial aid, access to higher education.

George J. Nolfi, Marie D. Eldridge, Elmer F. Collins, Karl L. Alexander, Gail E. Thomas, B. K. Eckland, Stephen P. Dresch, Alan P. Wagner.

Problems and Solutions—Science Education for the Deaf (16 Feb., SP): Elementary and high school science, college programs, among hearing students.

B. Edward Cain, Robert S. Menchel, Doris E. Hadary, Robert Wherlie, Francis C. Higgins, Tracy A. Hurwitz.

Science and the Needs of the Handicapped (17 Feb., SP): Research, education, and counseling needs; technology needs, assessment, diffusion, and transfer.

E. C. Keller, Jr., Robert W. Mann, Robert Larsen, Richard H. Johnson, John Gavin, Doris Hadary, Phyllis Stearner, Kenneth Ricker, R. A. Dudek, Jerry Turen, Lex Frieden, Ralf Hotchkiss, Hadi Madjid, H. Myron Weinberger.

Models of Learning and Their Implications for Science Education (17 Feb., SP): Object-person dichotomy, information processing, social factors, mass media, future environments, limits on knowledge.

Joseph I. Lipson, F. James Rutherford, Karl H. Pribram, Diane McGuiness, Jill H. Larkin, Harry C. Triandis, Allen Newell, Gregg Edwards, Kenneth E. Boulding.

16. Policy Development

Assessment of Technological Risk (13 Feb., SP): Pharmaceuticals, regulatory agencies and Congress, the Judiciary.

Richard A. Scribner, William A. Thomas, W. Brown Morton, Jr., Emilio Q. Daddario, William W. Lowrance, Donald Kennedy, Howard T. Markey, Harold P. Green, Richard H. Bolt.

The Technical Basis for Regulatory Decision-Making (13 Feb., SP): Health, safety, and environmental matters; technical, economic, political, and social considerations.

John M. Logsdon, Michael Baram, David Bazelon, Raphael Kasper, Albert H. Teich, Monte Throdahl, Eula Bingham.

Bureaucratic Maladies and Remedies (14 Feb., SP): Discontents, decentralization, competition, policy research and analysis, political control.

Carol H. Weiss, Allen H. Barton, Graham Allison, Robert K. Yin, William A. Niskanen, Charles E. Lindblom, Francis E. Rourke.

The State of Academic Science (14 Feb., SP): NSF report, basic research.

Harvey M. Sapolsky, Carl Kaysen, Bruce L. R. Smith, Joseph J. Karlesky, Albert H. Teich, Harvey Brooks, Sanford A. Lakoff.

Methodological Issues in Technology Assessment (15 Feb., SP): Context, strategy, methods, integrating technology assessment.

Joshua Menkes, G. Patrick Johnson, Aaron Wildavsky, Willis W. Harman, Joe Armstrong, Joseph P. Martino, Frederick A. Rossini, Alan L. Porter, Patrick Kelly, Daryl E. Chubin, Melvin Kranzberg, Donald Michael

The Influence of Product and Process Regulation on Technological Change (15 Feb., SP): Long- and short-term impacts, innovation in industry, technological change and innervation.

David L. Bodde, Joseph T. Ling, William J. Abernathy, Jordon D. Lewis, Glenn E. Schweitzer, Victor Berlin.

The Modeling of Social Systems: Its Uses and Limitations in Societal Problem-Solving (15 Feb., SA): Formal modes of analysis, vehicle for public policy, large-scale social systems, explications and judgment.

A. George Schillinger, John Crecine, Nathaniel J. Mass, Garry Brewer, Anthony J. Wiener.

OMB and OSTP in American Science Politics: What Really Happens in R & D Budgeting (16 Feb., SP): Agricultural research, post-embargo energy RD & D policy, issue-making and issue development, long-range planning.

Thane Gustafson, Philip M. Smith, Thomas P. Grumbly, Jack Appleman, Patricia Evans Perry.

Energy Sources, Technological Options, and Environmental Repercussions: Spatial and Temporal Assessment (16 Feb., SA): Industrial emissions, locational adjustment, planning at the state level.

Manoucher Parvin, Allen V. Kneese, Richard Tepel, Salvador R. Bozzo, Leonard D. Hamilton, Owen Carroll, Melvin Kranzberg, Sanford Bordman, Ralph D'Arge, Richard Dusansky, Dennis Young.

Avoiding Societal Catastrophes and Maximizing Social Opportunities: The General Systems Challenge (16 Feb., SA).

Richard F. Ericson, Russell Ackoff, Hazel Henderson, Margaret Mead, John H. Sutherland, John N. Warfield, Gerald M. Weinberg.

Advising the Congress on R & D; The OTA Role (16 Feb., SP): Institutional experiment, analytical capabilities, congressional influence, national needs.

Carolee McBee, Jerome B. Wiesner, Ellis R. Mottur, Harvey Brooks, Lewis M. Branscomb, Gilbert F. White, Charles Mosher, John Stewart.

Investing in Integrated Systems in Communications, Health and Energy (17 Feb., SA): Electronic communication, social alternatives, system considerations.

George K. Chacko, Sherry Arnstein, Piet B. Bos, Kenneth F. Gordon, Charles D. Flagle, Morton B. Prince.

Federal Regulations: Ethical Issues and Social Research (17 Feb., SP): Human subjects, dilemmas, assuring confidentiality, costs and benefits.

Murray L. Wax, Bradford H. Gray, Joan Cassell, Robert F. Boruch, Joseph S. Cecil, Virginia L. Olesen, Clark C. Abt.

17. Policy Issues

Population, Resources, Energy, and the Environment: Reports on the Debates (13 Feb., SP): Fertility decline, growth-equity, nuclear, environmental, leisure.

David L. Sills, Leon Tabah, Denton E. Morrison, Robert C. Mitchell, Meinolf Dierkes, Thomas K. Burch, Herman E. Daly, Dorothy W. Nelkin, Charles T. Unseld, C. P. Wolf.

Drug Crops, Public Policy, and International Control (13 Feb., SA): Turkish poppy cultivation, U.S.-Mexican relations, herbicide use, human biology, opium ecology, Southeast Asia.

Joel M. Jutkowitz, Karen Kerner, Donald L. Dahlsten, Sean Swezey, Arthur W. Galston, David A. Feingold.

US-USSR Exchanges in Science and Technology: Working with Soviet Scientists (13 Feb., SP): Myocardial infarction, magnetohydrodynamics, earthquake hazard research.

Egon E. Loebner, John Turkevich, Joseph S. Nye, James E. Muller, Peter R. Maroko, Eugene Braunwald, William D. Jackson, Brian E. Tucker, Milton J. Wilkinson.

Solar System Exploration: Should It Be a National Commitment? (14 Feb., SP).

Daniel H. Herman, Edward P. Boland, A. Thomas Young, Carl Sagan, Albert D. Wheelon, Charles A. Mosher, Michael B. McElroy, Eliot Cutler.

International Trends in Applying Science and Technology: Problems, Opportunities, and Policies (14 Feb., SP):

Rodney W. Nichols, Franklin Huddle, Lucy Benson, Charles Dennison, Elizabeth Jager, Walter Orr Roberts, Frederick Seitz, Hugh Miller, John Stewart, John Logsdon, Joâo Franck da Costa, Raymond Vernon, Joseph Mungai, Ali Khamis, Jean Wilkowski, Harvey Wallender, Victor Rabinowitch, Gilbert S. Omenn.

Neighborhoods, Cities, and Regions: Governing the Future of Urban Spaces (15 Feb., SA): Urban government, community boundaries, dimensions of space, community design, self-help housing, energy and information, conservation strategies, continuous transformations.

Robert Warren, Michael N. Albanes, Louis F. Weschler, Ben H. Bagdikian, Roger M. Downs, Pierre Clavel, Mitchell L. Moss, Roland L. Warren, Gregg Edwards, Don Terner, John P. Eberhard, Woody Rainey, Don Schon.

Domestic and International Scientific Aspects of Extended Marine Jurisdiction (15 Feb., SP): Scientific challenge, fishery, marine and social science, coastal zone, information requirements, forensic aspects, ocean policy.

Brian J. Rothschild, Dayton L. Alverson, Harvey R. Bullis, Jr., Edward Miles, Robert W. Knecht, Robert L. Edwards, Izadore Barrett, William C. Brewer, Jr., James W. Curlin.

Creative Tensions: Federal Energy Policies versus State Energy Policies (16 Feb., SP): U.S. Dept. of Energy, consuming state, federal land-leasing, states' rights, conservation, alternative technologies, ERDA program.

Frank M. Graves, Jon M. Veigel, Hermann P. Bretsch, Alvin Alm, Richard Maullin, George Turcott, James Monahan, Gary Wicks, John A. Roth, Sumner Myers, John P. Millhone, James S. Kane, Maxine L. Savitz, Richard Werthamer, Gene Mannella.

Problems and Progress in Scientific and Technical Advising for Policy Formulation at the State Level (17 Feb., SP): Strengthening capacity, regional resources, Rocky Mountain States, Michigan, Maryland, Louisiana, Colorado, Iowa.

Robert W. Hanson, Edward L. Helminski, E. Gerald Meyer, William C. Taylor, Harry Kriemelmeyer, William B. De Ville, Floyd C. Mann.

Some Views from Inside Congress on Water, Pollution Biohazards, and Nutrition (17 Feb., SP): Water, CO_2, biohazard control, nutrition issues.

Richard A. Scribner, Allan Hoffman, Yacov Y. Haimes, Thomas Moss, Haven Whiteside, R. Darryl Banks, George Jacobson, Kristen W. McNutt.

Schedule of Contributed Paper Sessions

Listed below are the room and time assignments for the various contributed paper sessions. Except where explicitly noted, all sessions are of the traditional slide format.

Mon., 13 Feb., 9 a.m.–12 noon

Physical Sciences . . . . . .SA/Committee
Biophysics and Biochemistry . . . . . .SA/Colonial
Zoology (Reproductive) . . . . . .SA/Council
Pharmaceutical Sciences . . . . . .SA/Caucus
Population and Urban Affairs . . . . . .SA/Cabinet

Mon., 13 Feb., 3 p.m.–6 p.m.

Energy (Policy) . . . . . .SA/Committee
Mathematical Biology . . . . . .SA/Colonial
Zoology (General) . . . . . .SA/Council
Medical Sciences (General) . . . . . .SA/Caucus
Archaeology and Anthropology . . . . . .SA/Cabinet

Tue., 14 Feb., 9 a.m.–12 noon

Energy (Decentralized) . . . . . .SA/Committee
Agriculture and Food . . . . . .SA/Colonial
Zoology (Insect) . . . . . .SA/Council
Medical Sciences (Metabolism) . . . . . .SA/Caucus
Psychology (Developmental) . . . . . .SA/Cabinet
Biological Sciences (POSTER) . . . . .SP/Exhibit Hall

Tue., 14 Feb., 3 p.m.–6 p.m.

Energy (Geothermal) . . . . . .SA/Committee
Ecology (Marine) . . . . . .SA/Colonial
Zoology (Marine) . . . . . .SA/Council
Medical Sciences (Cancer & Diseases) . . .SA/Caucus
Psychology (Behavioral) . . . . . .SA/Cabinet
Biomedical Sciences & Health (POSTER)
. . . . . .SP/Exhibit Hall

Wed., 15 Feb., 9 a.m.–12 noon

Energy (Resources) . . . . . .SA/Committee
Ecology (Terrestrial) . . . . . .SA/Colonial
Zoology (Physiology) . . . . . .SA/Council
Health Care . . . . . .SA/Caucus
Psychology (Clinical) . . . . . .SA/Cabinet
Social & Behavioral Sciences (POSTER) SP/Exhibit Hall

Wed., 15 Feb., 3 p.m.–6 p.m.

Geophysical Sciences . . . . . .SA/Committee
Botany (Terrestrial) . . . . . .SA/Colonial
Zoology (Neural & Visual) . . . . . .SA/Council
Medical Sciences (Cardio. & Stress) . . . .SA/Caucus
Psychology (Pysiological) . . . . . .SA/Cabinet
Economics, Policy, Education (POSTER)
. . . . . .SP/Exhibit Hall

Thu., 16 Feb., 9 a.m.–12 noon

Atmospheric & Hydrospheric Sciences SA/Committee
Botany (Marine) . . . . . .SA/Colonial
Molecular & Cellular Biology . . . . . .SA/Caucus
Science Policy . . . . . .SA/Council
Education (Curricula) . . . . . .SA/Cabinet
Amer. Jr. Academy of Science (General) . .SP/Adams
Mathematical & Physical Science (POSTER)
. . . . . .SP/Exhibit Hall

Thu., 16 Feb., 3 p.m.–6 p.m.

Genetics & Evolution . . . . . .SA/Caucus
Sociobiology . . . . . .SA/Council
Economics . . . . . .SA/Colonial
Philosophy of Science . . . . . .SA/Committee
Education (Opportunities) . . . . . .SA/Cabinet
Amer. Jr. Academy of Science (Biomed) . .SP/Adams

Fri., 17 Feb., 9 a.m.–12 noon

Education (General) . . . . . .SA/Cabinet

Annual Meeting Washington
12-17 February 1978

Advance Registration Form (F)

ENCLOSED IS:

AAAS Member: ☐ $24 Single Registration Fee ☐ $36 Double Registration Fee (attendant and spouse)

Non-Member: ☐ $30 Single Registration Fee ☐ $42 Double Registration Fee (attendant and spouse)

Student: ☐ $12 Single Student Registration Fee ☐ $18 Double Registration Fee (student attendant and spouse)

Non-Member applying for AAAS membership* and meeting registration: (Annual membership dues include 52 issues of SCIENCE. Double membership—individual and spouse—includes one subscription to SCIENCE.)

☐ $52 Single Registration and Membership ($24 registration and $28 dues)

☐ $64 Double Registration and Single Membership (name of applicant _____) ($36 registration and $28 dues)

☐ $76 Double Registration and Membership ($36 registration and $40 dues)

*These rates apply to USA membership only. Inquire for Canadian or Foreign rates.

Program and badge will be mailed to each registrant in mid-January.
Registrations received after 20 January will be held at the AAAS Information Booth.

NAME OF REGISTRANT: _____
(Last Name) (First and Initial)

NAME OF SPOUSE REGISTRANT: _____
(Last Name) (First and Initial)

REGISTRANT'S MAILING ADDRESS: _____
[For receipt of program(s), badge(s), and SCIENCE (for new applicants)] (Street)

_____
(City/State) (Zip Code)

ADDITIONAL REGISTRANTS: _____
(With same mailing address. Use new form if address differs)

_____

REGISTRANT'S INSTITUTION OR COMPANY: _____

_____ _____ _____
(City) (State) (Zip Code)

Check days attending: Sun ☐ Mon ☐ Tue ☐ Wed ☐ Thu ☐ Fri ☐

CONVENTION ADDRESS: _____
(Where you can be reached) (Hotel or Street Address)

Note: Special one-day attendance registration is available at the Meeting Registration Desks ($12 regular, $6 student).
A book containing the abstracts of the Meeting papers will also be available at the Registration Desks at an additional charge of $5.

☐ **Please check here if you need special services due to handicap. We will contact you prior to the meeting.**

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

SURVEY OF ATTENDANTS
Annual Meeting, Washington, 12–17 February 1978

Your answers to the following questions will help us in planning future AAAS Annual Meetings. Please complete the following form and either return it with your registration form or send in separately (to the same address) if you wish to respond anonymously (in any case, the two forms will be processed separately).

Principal Professional Interest
11 ☐ Physical, mathematical
12 ☐ Biological, medical
13 ☐ Engineering
14 ☐ Social, behavioral
15 ☐ Science policy
16 ☐ ..... (other)

Principal Professional Activity
21 ☐ Teaching, education
22 ☐ Health practice
23 ☐ Other practice, consulting
24 ☐ Research, development
25 ☐ Administration
26 ☐ ..... (other)

Institutional Affiliation Type
31 ☐ University, 4-year college
32 ☐ Other educational
33 ☐ Industrial, commercial
34 ☐ Other private
35 ☐ Government
36 ☐ ..... (other)

Highest Educational Level
41 ☐ Doctoral Degree
42 ☐ Master's Degree
43 ☐ Other professional
44 ☐ Bachelor's Degree
45 ☐ ..... (other)

Age
51 ☐ Under 26 years
52 ☐ 26 to 35 years
53 ☐ 36 to 45 years
54 ☐ 46 to 55 years
55 ☐ 56 to 65 years
56 ☐ Over 65 years

Distance Traveled to Meeting
61 ☐ Under 51 miles
62 ☐ 52 to 150 miles
63 ☐ 151 to 400 miles
64 ☐ 401 to 1000 miles
65 ☐ 1001 to 3000 miles
66 ☐ Over 3000 miles

Last AAAS Meeting Attended
71 ☐ 1972 in Washington
72 ☐ 1973 in Mexico City
73 ☐ 1974 in San Francisco
74 ☐ 1975 in New York
75 ☐ 1976 in Boston
76 ☐ 1977 in Denver

Hotel Reservations

Room Rates*

Annual Meeting
Washington
12-17 February 1978

The 144th National Meeting of the American Association for the Advancement of Science will be held in Washington, DC, 12–17 February 1978. Symposia, contributed paper sessions, and all other Meeting activities are scheduled in the Sheraton-Park (headquarters) and Shoreham Americana hotels. Both hotels will have AAAS registration and information desks and provide housing at the following convention rates:

Hotel	Single	Double	Twin	Suites**	Parking
SHERATON-PARK *(Headquarters)* 2660 Woodley Road, N.W. *(No. of rooms held: 1000)*	$32 35 38 40	$42 45 48 50	$42 45 48 50	$85 and up	$2.60 for daytime parking. $3.60 per 24 hrs. (*inquire at the Front Desk about in and out privileges*).
SHOREHAM AMERICANA 2500 Calvert Street, N.W. *(No. of rooms held: 600)*	$30	$40	$40	$70 and up	$3.00 per 24 hrs. (*with in and out privileges*).

STUDENT RATES: Both the SHERATON-PARK and SHOREHAM AMERICANA hotels have provided these special room rates for students:

Triple occupancy: $15 per person; **Quadruple occupancy:** $12 per person

Only prearranged groups of 3 or 4 students with the same arrival and departure dates qualify for these special rates. All names must appear on the Hotel Reservation Form.

*Per day; add 8% D.C. sales tax. Charge for additional person in room, $10; rollaway beds or cots, $10 (both hotels.) Children accommodated free in same room with parents: Sheraton-Park, age 18 and under; Shoreham-Americana, age 14 and under.

**Lowest available rate for one-bedroom/parlor suites; rates for larger suites available on request.

NOTE: If room rate specified is not available, the next available higher rate will be assigned. Confirmation will come to you directly from the hotel. Please make all reservation changes and cancellations through the Housing Bureau *in writing*. Room assignment will be delayed if any information is omitted from the Hotel Reservation Form.

HOTEL RESERVATION FORM

Please type or print

Reservations received after 20 January cannot be assured.
The Housing Bureau will not accept any reservations by telephone.

CHOICE OF HOTEL: First _____ Second _____

ROOM: ☐ Single ☐ Double ☐ Twin **SUITE:** ☐ 1 Bedroom ☐ 2 Bedrooms **PREFERRED RATE $** _____

STUDENTS: ☐ 3 persons per room ☐ 4 persons per room

Please indicate any special housing needs due to a handicap: _____

_____

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. Check out-time is 1:00 p.m. at both hotels.

NAMES AND ADDRESSES OF ALL OCCUPANTS OF ROOM

Name _____ Name _____

Address _____ Address _____

City _____ State _____ Zip _____ City _____ State _____ Zip _____

Name _____ Name _____

Address _____ Address _____

City _____ State _____ Zip _____ City _____ State _____ Zip _____

Hotel, confirm reservation to: _____

Mail to: AAAS Housing Bureau
1129 Twentieth Street, N.W., Washington, D.C. 20036