American Association for the Advancement of Science

SCIENCE

9 September 1988 $3.00
Vol. 241 ■ Pages 1265–1396

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SCIENCE

ISSN 0036-8075
9 SEPTEMBER 1988
VOLUME 241
NUMBER 4871

■ **SCIENCE is published weekly on Friday, except the last week in December, and with an extra issue in February by the American Association for the Advancement of Science, 1333 H Street, NW, Washington, DC 20005.** Second-class postage (publication No. 484460) paid at Washington, DC, and at an additional entry. Now combined with **The Scientific Monthly®** Domestic individual membership and subscription (51 issues): $70. Domestic institutional subscription (51 issues): $110. Foreign postage extra: Canada $32, other (surface mail) $32, air-surface via Amsterdam $85. First class, airmail, school-year, and student rates on request. Single copies $3.00; back issues $5.00; Biotechnology issue, $5.50 ($6 by mail); classroom rates on request; Guide to Biotechnology Products and Instruments $16 ($17 by mail). **Change of address:** allow 6 weeks, giving old and new addresses and seven-digit account number. Authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of $1 per copy plus $0.10 per page is paid directly to CCC, 21 Congress Street, Salem, Massachusetts 01970. The identification code for *Science* is 0036-8075/83 $1 + .10. **Postmaster:** Send Form 3579 to *Science*, 1333 H Street, NW, Washington, DC 20005. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

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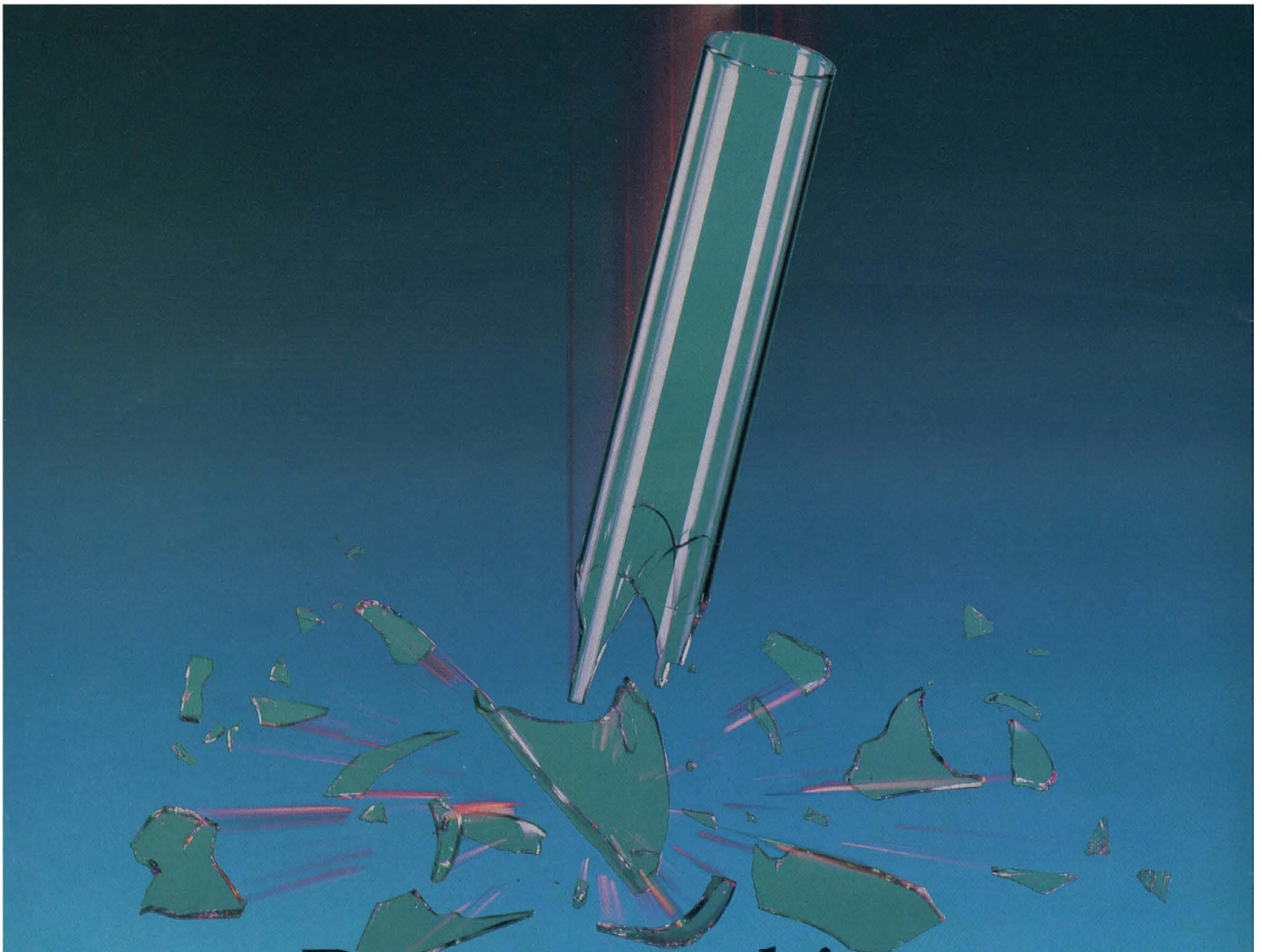
COVER Image composite of the planet Uranus (center) and five of its moons, as viewed by the Voyager 2 spacecraft. Moons (clockwise from top) are Titania, Miranda, Ariel, Umbriel, and Oberon. See page 1322. [National Aeronautics and Space Administration/Jet Propulsion Laboratory]



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This Week in
SCIENCE

Universal literacy

UNIVERSAL literacy is one of the goals of the United States that has proved to be a "moving target" (page 1293). The definition of literacy has taken on different meanings as technologic and economic conditions have changed: what qualified a person as "literate" in the 18th century—the ability to read aloud familiar Biblical passages—would, if this were the limit of a person's skills today, firmly establish that individual as illiterate. Millions of people in the United States are considered semiliterate, falling between the extremes of literate and illiterate. Their problems are often economic and social as well as educational, and they get trapped in a vicious cycle. Miller reviews recent research on reading—what defines a skilled reader, what processing and comprehension difficulities interfere with skillful reading, what role is played by prior knowledge and metacognition (a person's awareness of cognitive processes)—that might contribute to the development of better educational policies. He discusses the complex relations of reading, learning, and work skills and questions whether and how the level of literacy of the U.S. population can be upgraded to meet the increasing demands of the workplace for more literate workers.

Computational neuroscience

HOW the brain works continues to be among the most intriguing of topics. The brain has many levels of organization, and investigations of brain function have ranged from studies at the molecular to those at the behavioral level. In the field of computational neuroscience, models are developed for synthesizing information on how the brain might work, with an important goal being to discover what algorithms the brain uses for processing and assembling information into meaningful symbols and thoughts (page 1299). Two types of models now in use, classified as realistic (those large-scale simulations that incorporate as much detail as is available) and simplifying (those that capture important principles), are expected to be well integrated in future models. Sejnowski *et al.* discuss the models, the computer technology used for making them, and how computational neuroscience has been used for understanding vision at the systems, network, cellular, and biophysical levels. Although a model can show how, at some level, the brain might work, it does not prove that it works in that way; nonetheless, a good model can guide experimental work.

Icy volcanism on Ariel and Miranda

THE high resolution images made by the Voyager spacecraft as it flew by Uranus, Saturn, and Jupiter show old and young terrains juxtaposed, indicating that there has been extensive resurfacing in this distant region of the solar system (cover). Jankowski and Squyres assessed some of the morphologic features of Ariel and Miranda, two of the small icy satellites of Uranus, and conclude that they are best accounted for by resurfacing by solid, icy materials (page 1322). This is the first example of solid-state volcanism in the solar system. Inferences from the topography indicate that the extruded material would have been less viscous than water ice but more viscous than water at uranian temperatures; ices of ammonia or methane were probably mixed in with the water ice to increase its mobility. In Saturn's system, there is evidence for liquid extrusion; in Jupiter's, buoyancy considerations favor warm ice extrusion; whether the systems of Neptune and Pluto, like the uranian system, have experienced solid-state ice volcanism remains to be seen.

Designer vessels

A novel method for promoting in vivo blood vessel formation is described by Thompson *et al.* (page 1349). Angiogenesis requires cell migration, proliferation, and differentiation, and two polypeptides are known to induce it. One inducer, class I heparin-binding growth factor (HBGF-I), was bound to commercial gelatin sponges, and these matrices were implanted in necks and peritoneal cavities (attached to various organs) of rats; the small amounts of incorporated HBGF-I induced angiogenesis at the sites of implantation. This system has a number of potential biomedical and research uses: new vessel formation might be induced where vessels have been lost through disease or aging, vessel growth might be induced in newly grafted tissues, and vessels might be constructed for the transport of cells, other natural substances, and drugs into or out of organs for clinical and experimental purposes.

AIDS virus test

A new "front line" qualitative test for antibodies to the AIDS virus (HIV-1) has been developed by Kemp *et al.* (page 1352). The test is simple and uses only very small samples of whole blood (10 microliters); the results—which indicate whether or not the blood contains antibodies to HIV-1—can be known within 2 minutes. To test the blood, a monoclonal antibody is added that binds to red blood cells but does not cause the cells to agglutinate; attached to the antibody is a synthetic polypeptide corresponding to a portion of the envelope protein of HIV-1. If the tested blood sample also contains antibodies to HIV-1, these antibodies will bind to the synthetic peptide and cause the red blood cells to cling to each other; such agglutination can be seen on a glass slide. This test could be of great value in developing countries where rapid, simple, and cheap testing is essential for identifying individuals infected with HIV-1. It also may be helpful for screening blood in countries where more quantitative but expensive and labor-intensive tests are used for identifying antibodies, and, in this application, it may contribute to the protection of health care workers.

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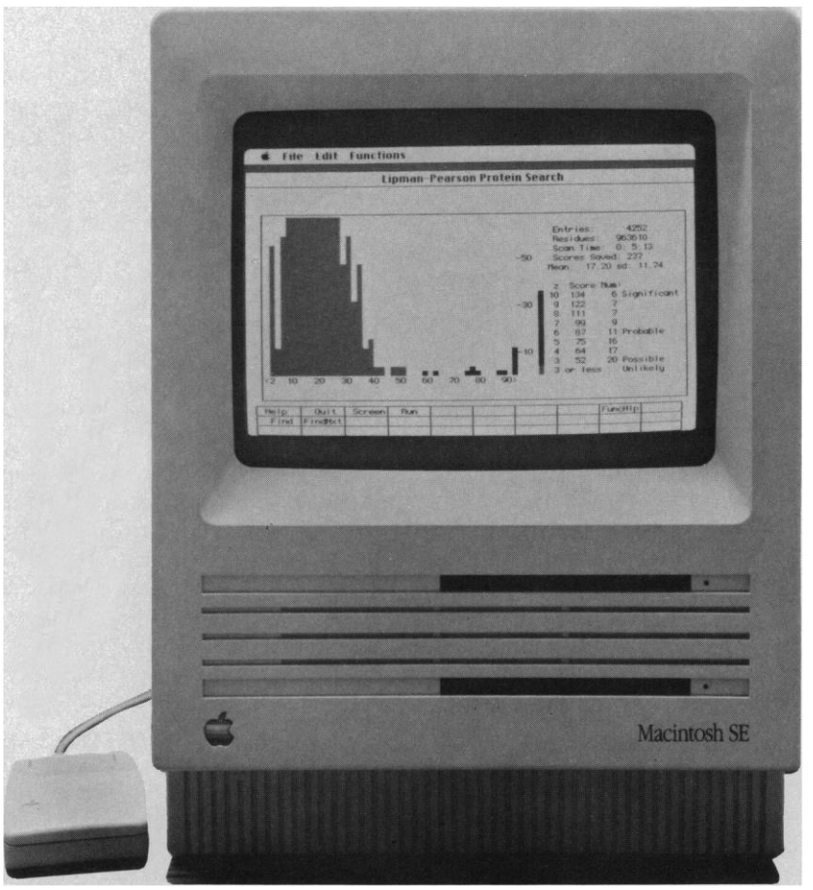

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SCIENCE

9 SEPTEMBER 1988
VOLUME 241
NUMBER 4871

Thinking Tough

The nation is intoxicated with huffing, puffing, and crocodile tears as a substitute for policy in the war on drugs. Our rush to denounce drugs and their suppliers and users is exceeded only by our unwillingness to develop a consistent overall policy. Our youths, particularly our disadvantaged youths, are being taught that crime pays. Our law enforcement system is being corrupted. Our foreign policy is jeopardized. Yet the number of drug addicts and their influence increases. Withdrawal from policies that have not worked, in order to face reality, will be as painful as withdrawal from drugs themselves. But the time has come to act tough or to think tough.

To act tough we would seal the borders, mobilize the military, destroy foreign sources, crack down on the kingpins, enforce zero tolerance, and "round up the usual suspects." Following those policies would help alleviate the drug problem, but even the mention of such measures exposes their flaws. With approximately 200 million people crossing our borders every year, are we likely to seal them? With an average penalty for murder these days of 12 years, are we likely to punish kingpins effectively? When congressional concern over the dangers of paraquat to drug users causes interdiction of the program to spray foreign fields, are we likely to destroy outside sources? If we do not like to enforce zero tolerance on yacht owners, will we enforce it on teenagers? In short, is it realistic that the nation will get tough and stay tough? It would not be impossible if we were willing to project the consequences of toughness, grit our teeth, and live with them.

If we will not act tougher, then thinking tough may be the only approach, and the controversial alternative, decriminalization, deserves attention. A little reading of history yields striking parallels between prohibition of alcohol in the 1920s and prohibition of drugs today. Just as many decent people recoiled at legalizing alcohol in the past, many individuals react against legalizing drugs today. Yet, what are the facts? Many are addicted to cigarettes, alcohol, or tranquilizers, but we do not need to kill, bribe, or form crime syndicates to obtain these substances. Will decriminalization result in many more people becoming addicted? In the 1900s, heroin was legal in the United States, and the proportion of addicts in the population was not appreciably different than it is today. The Netherlands legalized narcotics, and the percentage of addicts in that country decreased.

To say that legalizing drugs is an obvious solution is, however, a vast understatement. A properly planned program would have to be developed with careful thought, to include components like government-sponsored stores, high taxes to support educational and treatment programs, low-cost legal drugs, and only negative advertising. Such a program would at least destroy the incentive of impoverished countries to invest in crops for export, reduce a source of local corruption, and eliminate exorbitant profits by illegal dealers. Although it would not prevent individuals under the influence of drugs from behaving unpredictably, sanctions against illegal behavior rather than illegal drugs would also remove most of the profit motive from addict recruitment. An educational campaign that identified drugs with losers and failure rather than with glamor and success might work.

The time has come to apply more scientific methods to this immense problem. We might approximate sealing our borders, enacting zero tolerance to get underlings to testify against the kingpins, and applying tougher penalties, but the public would have to be convinced that a well-developed consistent plan was in place to justify such extreme and expensive procedures. The alternative of decriminalization would require equally careful thought. To aid in a decision, *Science* will be producing a number of news stories and articles on the history and likely consequences of various approaches. What should no longer be tolerated, whether in erudite publications or in the bombast of political debate, is the advocacy of "get tough" or "legalize" without the development of specific, significant plans of action to make the proposed program successful.

Whatever course of action is advocated will take vision and courage: either to advocate far tougher laws to a rather permissive society or to advocate legalization and control of substances that are known to be bad for people. The first step will be to admit that the present on-again off-again vacillation between indignation and compassion, enforcement and tolerance, panic and complacency, is a failure. Then, perhaps we will be willing to think tough about the real alternatives and develop a rational and effective solution to a historically difficult problem.—DANIEL E. KOSHLAND, JR.

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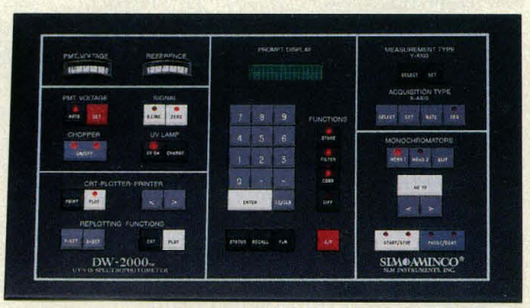

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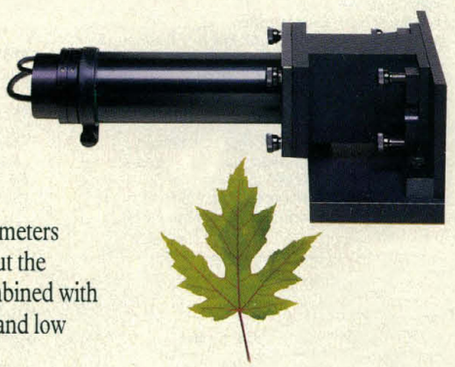

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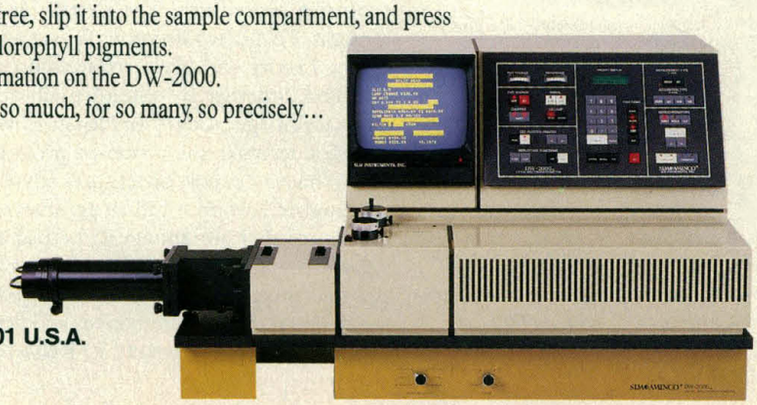

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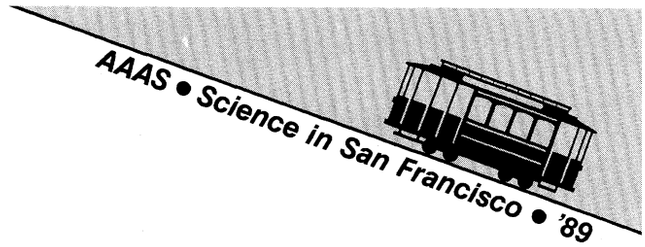

1989 AAAS Annual Meeting

San Francisco Hilton, 14–19 January

Preliminary Program, Part 1

We've done it again! After the roaring success of the Boston Meeting last February, our encore is an even bigger and better Annual Meeting program for San Francisco in '89.

In fact, the program is so big that we're presenting the information to you in three separate issues of *Science*.

This issue presents Part 1 of the preliminary program, a detailed breakdown of our **Physical Sciences & Technology** lineup. But don't miss the other issues that detail our agenda for the **Life Sciences & Technology** (23 September issue) and for the **Social Sciences & Science Policy** (30 September issue). A brief summary of each follows:

The **Physical Sciences & Technology** program (described on the following pages) features a six-session treatment of **chaos**, including dynamical, biological, celestial, and economic systems; an in-depth examination of neural networks and of spatial statistics; an extensive survey of **physics** (jointly arranged with the American Physical Society [APS] and the American Association of Physics Teachers [AAPT]), with a full 2-day treatment of synchrotron radiation and a two-session treatment of the scanning tunneling electron microscope; a four-session treatment of the frontiers of **chemistry**, including dynamics, catalysis, inorganic, and bioorganic chemistry; a five-session treatment of **ocean processes**; a five-session treatment of **climate changes**, impact, and processes; and much more.

Our program for **Life Sciences & Technology** will be detailed in the 23 September issue, and will feature seminars on **protein folding** and on **plant molecular biology and genetic engineering**, as well as extensive treatments of **receptors**, **developmental biology and gene expression**, **retroviruses**, **AIDS**, the **human genome** project, and many aspects of **ecology** (including the impacts of drought) and **agriculture**.

Finally, the 30 September issue will bring you full details of our program on **Social Scien-**

(continued on page 1363)

Here's what you'll find:

☐ ***Over 250 sessions:*** Choose from a full schedule of symposia, seminars, technical sessions, and workshops covering the **Physical Sciences & Technology** (listed on the following pages), **Life Sciences & Technology** (23 September issue of *Science*), and **Social Sciences & Science Policy** (30 September issue of *Science*).

☐ ***Major plenary lectures:*** Hear 15 world-renowned scientists speaking on a wide range of topics (this page).

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☐ ***Poster sessions:*** Exchange ideas with interested colleagues in a full series of poster sessions. To participate, see "Call for Contributed Papers" on page 1363.

☐ ***Science Film Festival:*** See some 50 science films for students and professionals.

☐ ***Two meetings for the price of one:*** As a AAAS Annual Meeting registrant, you will also have full access to all sessions of the concurrent Joint Winter Meeting of the American Association of Physics Teachers (AAPT) and the American Physical Society (APS).

☐ ***Discounts on travel:*** United Airlines and Delta Air Lines offer special discount fares to the Annual Meeting in San Francisco (and optionally on to Honolulu) for travel during 10–26 January 1989. The discounts are available only through the airlines' convention reservation desks. For details call one of these numbers and give the appropriate AAAS convention code:

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☐ ***Savings on advance registration:*** The advance registration deadline is 16 December. To obtain the discounted advance registration rate and the low hotel convention rates, use the forms on page 1364.

Plenary Lectures

Saturday, 14 January, 8:30 pm: Keynote Address, DONALD KENNEDY *(Stanford Univ.)*.

Sunday, 15 January, 1:00 pm: Carey Lecture, "Cheer Up, Things Could Be Worse," WILLIAM T. GOLDEN *(AAAS Treasurer)*. ***1:00 pm:*** "Protein Folding," FREDERIC M. RICHARDS *(Yale)*. ***8:30 pm:*** "The Search for Eve," ALLAN C. WILSON *(UC–Berkeley)*.

Monday, 16 January, 1:00 pm: Waterman Lecture, PETER SCHULTZ *(UC–Berkeley)*. ***1:00 pm:*** "Plant Molecular Biology and Biotechnology," SPEAKER TO BE ANNOUNCED. ***8:30 pm:*** "Resource Allocations for Science," FRANK PRESS *(National Academy of Sciences)*.

Tuesday, 17 January, 1:00 pm: Sarton Lecture, "The Politics of the Meter Stick," JOHN L. HEILBRON *(UC–Berkeley)*. ***1:00 pm:*** "Opportunities for Synchrotron Radiation Research," ARTHUR BIENENSTOCK *(Stanford Synchrotron Radiation Laboratory)*. ***8:30 pm:*** AAAS President's Lecture, "From the President of AAAS to the President of the United States," WALTER E. MASSEY *(Univ. of Chicago)*.

Wednesday, 18 January, 1:00 pm: "Optical Astronomy in California," ROBERT P. KRAFT *(Lick Observatory, UC–Santa Cruz)*. ***1:00 pm:*** "Molecular Genetics of Cancer," J. MICHAEL BISHOP *(UC–San Francisco)*. ***8:30 pm:*** "Genetics and the Disappeared: Search for Two Generations," MARY-CLAIRE KING *(UC–Berkeley)*.

Thursday, 19 January, 1:00 pm: "Superconductivity," SHOJI TANAKA *(Univ. of Tokyo)*. ***1:00 pm:*** "Earthquake Prediction," ALLAN G. LINDH *(USGS, Menlo Park, CA)*.

Physical Sciences & Technology*

Frontiers; Chaos

Frontiers of the Physical Sciences: 1989 *(2 sessions, 1/19).* Optical astronomy observations; aviation weather hazards; material dating.

Chaos and Dynamical Systems *(1/15).* Dynamics; knot theory; fractal basin boundaries.

Chaos in Biological Systems: Physiology and Medicine *(1/15).* Neural-biological systems; structure and function of polypeptides and proteins.

Chaos *(4 sessions, 1/16–1/17).* Quantized systems; turbulence; global affairs; celestial systems.

Mathematics, Statistics & Computing

Statistical Description and Modelling of Spatial Variability: Theory and Applications *(3 sessions, 1/15–1/16).* Interpolation; geostatistics; agroecosystems; geographic information systems.

Logic Today *(1/18).* Nonstandard mathematics; computer programming; semantics.

The Next Generation of Neural Nets *(1/18).* Modularity; computational learning theory.

Computational Neural Networks for Perception and Behavior *(1/19).* Neural mapping; mapping sensory-motor coordination; visual-acoustic fusion.

Psychobiological Models of Parallel Processing in the Perception of Time, Space, and Number *(1/19).* Mathematical and information-processing models; animal cognition.

Physics

High Energy Physics: New Insights and New Aspirations *(1/15).* Colliders; cosmic rays.

The Role of Precision Measurements in Physics *(1/15).* Single ion; neutral atoms; parity violation; hydrogen.

Synchrotron Radiation *(4 sessions, 1/16–1/17).* Accelerator physics facilities; x-ray diffraction and absorption studies; medical imaging.

Scanning Tunneling Microscopy *(2 sessions, 1/17).* Metals; three-dimensional imaging; semiconductor interfaces.

Monte Carlo Methods and Statistical Mechanics *(1/17).* Simulated annealing; quantum dynamics; stochastic relaxation; field theories.

Physics of the Atmosphere *(1/18).* Lightning; optical phenomena; clouds; precipitation.

New Perspectives in High Temperature Superconductivity *(1/19).* Chemistry and physics of metallic oxides.

Feynman Memorial *(2 sessions, 1/18).* Arranged by APS and AAPT.

Inertial Confinement Fusion: Stellar Conditions in the Laboratory *(1/19).* Lasers; ion beams.

Chemistry

Frontiers in Chemistry *(4 sessions, 1/16–1/17).* Chemical dynamics; organometallic chemistry; inorganic and bioorganic chemistry.

Astronomy; Planetary Science

Pulsars: Young and Old *(1/16).* Binary and millisecond pulsars.

The Farthest Things in the Universe *(1/16).* Quasars; background radiation; distant galaxies.

The Path of Life: From the Big Bang to the Big Brain *(2 sessions, 1/17).* Nucleosynthesis; extraterrestrial organic matter; terrestrial life; fossil records.

Apollo Plus 20: The New Moon, the Earth, and the Universe *(1/19).* Geology; time; cosmic records; moon's origin.

Geology; Oceanography

The Circum-Pacific Map Project: A Success Story of International Cooperation *(1/17).* Energy resources; tectonics; computer-based graphics.

The Nature of Large Earthquakes: Cooperative Research Between U.S. and Chilean Scientists *(1/18).* Seismic potential; high resolution mapping.

The Arctic: A New Key to World Climate and Resources *(2 sessions, 1/19).* Untapped natural resources; atmosphere-ocean-ice dynamics.

The Comparative Oceanography of Pacific Eastern Boundary Currents *(1/17).* Benthic and pelagic ecology; Humboldt current system; circulation and upwelling.

Plant Genetic Engineering Companies Please Note:

The **Plant Molecular Biology and Genetic Engineering** seminar at the AAAS Annual Meeting (details in the 23 September issue) will include short presentations by companies developing plant genetic engineering technology for crop improvement. Companies wishing to participate should FAX a request directly to Dr. Lawrence Bogorad, Harvard University, 617-495-9300, no later than 14 September.

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*The AAAS Annual Meeting Preliminary Program is being presented in three separate issues of *Science*:

1—Physical Sciences & Technology (this issue)
2—Life Sciences & Technology (23 September)
3—Social Sciences & Science Policy (30 September)

Mechanisms of Biological/Physical Interactions in Ocean Processes *(4 sessions, 1/18–1/19).* Turbulence; microscale and mesoscale linkages; food chain; remote sensing; in situ observations; models.

Atmospheric Science; Climate

Potential Impacts of Climate Change in California *(1/15).* Ozone; agriculture; water management.

Effects of Global Change on Vegetation and Crops *(1/15).* Elevated CO_2; crop production; modelling global vegetation.

Policy Implications of Climate Change *(1/16).* Impact mitigation, prevention, and adaptation.

Climate Change and U.S. Water Resources *(1/16).* Irrigated agriculture; urban water systems.

Weather and Climate: The Solar Variability and QBO Connections *(1/17).* Thermosphere response; stratosphere-troposphere coupling; tropospheric dynamic responses.

Engineering & Technology

New Technology for People with Disabilities *(1/16).* Use of electrical brain signals; robotic hand; verbal communication aid.

Statistics in Product and Process Design from Eli Whitney to the Present *(1/18).* New concepts and methods; productivity; social implications.

The New Hypersonics: Can an Airplane Fly to Orbit? *(2 sessions, 1/19).* Technical difficulties; aerodynamics and propulsion; applications.

Popular Science

Science for the Naked Eye; or, The Physics of Everyday Experience, XVI *(2 sessions, 1/15).*

Chemistry Is Fun! *(1/18).* Interactive exhibits; pre-high-school chemistry.

The Science and Technology of Winemaking in California *(1/18).* Sensory perception and chemistry of taste; climate and soil; economics; fermentation technology.

(continued from page 1361)

ces & Science Policy, which features an in-depth treatment of **risk**, issues in **arms control**, **competitiveness**, and **neurobehavior**, along with **psychology, anthropology, sociology, economics,** and **history and philosophy of science**, including issues related to **ethics and values in science, outreach to women and minorities**, and many facets of problems in **science and technology education**.

This blockbuster of a meeting, with over 250 sessions, features the cutting edge of science in all of its aspects. Register now and reap savings, and while you're at it, take advantage of this opportunity to present your poster-session paper on one of these many topics.

Come to San Francisco, home of the cable car and the Golden Gate Bridge, and of Fisherman's Wharf and the Cannery; a marvelous city for walking about and just looking, for sampling a host of different cuisines and fine wines, and for enjoying the mild California climate in mid-January. Come to San Francisco and bask in its marvelous ambience while experiencing the intellectual ferment that is the AAAS Annual Meeting. — ARTHUR HERSCHMAN

Call for Contributed Papers

The privilege of submitting a poster paper is open only to AAAS members and fellows, but they need not be authors of the papers they endorse. Presenters of papers must be registered for the Meeting (see registration form, overleaf) and must submit abstracts prior to the deadline. Each accepted paper will be assigned a 4′ × 6′ bulletin board for 1½ hours. Abstracts prepared in the correct format and received by AAAS before the deadline will be published in a book supplied to all registrants.

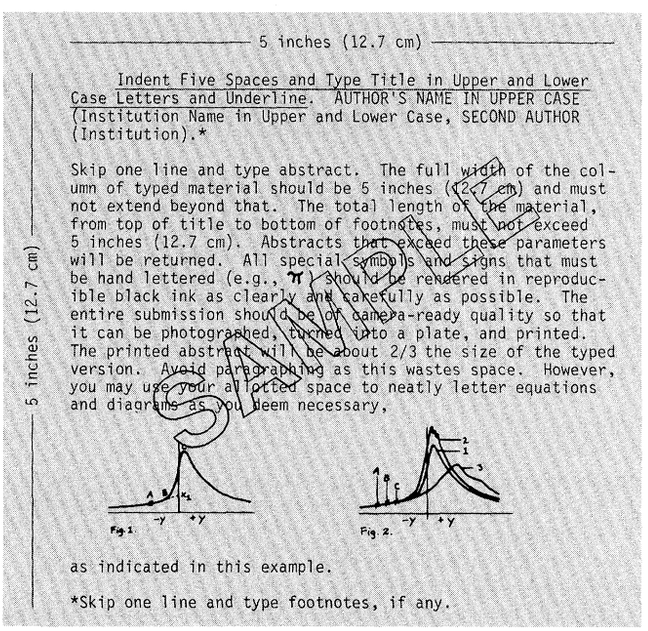
Topics: Papers should relate to Meeting session topics (see this issue and the 23 and 30 September issues of *Science*). We particularly welcome student papers, which are eligible for a series of prizes for best papers, to be awarded by AAAS and its Pacific Division. (Indicate with submission whether paper is to be judged.)

Abstracts: Copy must be typed on white paper to fit within a 5″ square. Use only a typewriter or letter-quality printer. Indent, space, underline, and capitalize as in the example; do not double-space the body of the text. Use reproducible black ink for all hand-lettering. Do not box abstract or cut and paste it onto another piece of paper.

Submissions: Above the 5″ square, type the name of the broad discipline that encompasses the subject matter and provide 3 index words to describe the area within the discipline. Below, type the name, affiliation, and signature of the member or fellow endorsing the paper, and the full name, address, and phone number of the person to be contacted regarding scheduling. Send original plus 1 copy of the abstract no later than 1 November 1988 to:

Contributed Papers, AAAS Meetings Office
1333 H Street, NW, Washington, DC 20005.

Deadline for Poster Session Abstracts: 1 November 1988


5 inches (12.7 cm)

5 inches (12.7 cm)

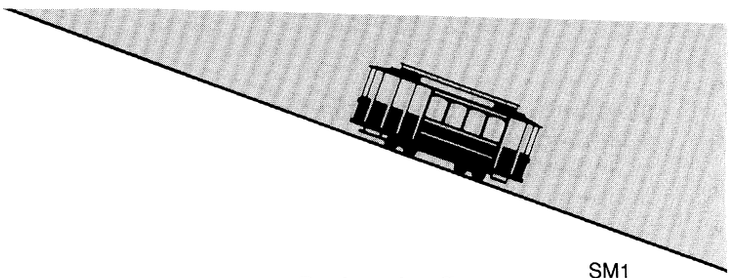
Indent Five Spaces and Type Title in Upper and Lower Case Letters and Underline. AUTHOR'S NAME IN UPPER CASE (Institution Name in Upper and Lower Case, SECOND AUTHOR (Institution).*

Skip one line and type abstract. The full width of the column of typed material should be 5 inches (12.7 cm) and must not extend beyond that. The total length of the material, from top of title to bottom of footnotes, must not exceed 5 inches (12.7 cm). Abstracts that exceed these parameters will be returned. All special symbols and signs that must be hand lettered (e.g., π) should be rendered in reproducible black ink as clearly and carefully as possible. The entire submission should be of camera-ready quality so that it can be photographed, turned into a plate, and printed. The printed abstract will be about 2/3 the size of the typed version. Avoid paragraphing as this wastes space. However, you may use your allotted space to neatly letter equations and diagrams as you deem necessary,

Fig. 1 Fig. 2.

as indicated in this example.

*Skip one line and type footnotes, if any.



Advance Registration Form

AAAS Annual Meeting ✦ San Francisco
14–19 January 1989

SM1

Name of registrant _____
(Please print or type) (Last) (First & initial)

Name of spouse registrant _____
(Last) (First & initial)

Institution/Company _____
(To be printed on badge) (Registrant)

_____
(Spouse registrant)

Mailing address _____
(Street)

_____
(City/State) (Zip code) (Telephone number)

Convention address _____
(Where you can be reached) (Hotel and/or telephone number)

Check days on which you will attend the Meeting: Sat ☐ Sun ☐ Mon ☐ Tue ☐ Wed ☐ Thu ☐

☐ Check here if you need special services due to a handicap. We will contact you before the Meeting.

■ **16 December deadline:** For registrations received by this date, we will mail registration badge, receipt, preliminary program, and voucher for the full program and abstracts. For registrations received after this date, we will hold all materials at the Advance Registrants' Desk at the San Francisco Hilton. Registrations postmarked after 16 December will be charged at the onsite rate. ■ Refund requests must be made by letter or telegram to the address below by 5 January and will be honored after the Meeting. **No refunds will made for cancellations received after 5 January.** **Fees:** [1] Nonmember fee includes introductory 6-month membership with 25 issues of *Science*. [2] Student rates apply to full-time undergraduate and graduate students and retirees. [3] Seminar space is limited; late registrations cannot be guaranteed.

Mail to: AAAS, Annual Meeting Registration, Room 830
1333 H Street, NW, Washington, DC 20005

Registration Fees

Meeting Only	Before 16 Dec	After 16 Dec
Regular member	☐ **$ 75**	$100
Regular nonmember[1]	☐ **$110**	$135
Student[2] member	☐ **$ 35**	$ 50
Student nonmember	☐ **$ 55**	$ 70
Spouse of registrant	☐ **$ 55**	$ 55
Meeting and One Seminar[3]		
Regular member	☐ **$160**	$185
Regular nonmember	☐ **$195**	$220
Student member	☐ **$ 75**	$ 90
Student nonmember	☐ **$ 95**	$110

Check one ☐ Protein Folding ☐ Plant Molecular Biology

Your registration fee ..... $ _____
Spouse registration fee .... $ _____
TOTAL AMOUNT ..... $ _____

☐ Check ☐ **VISA** ☐ **MasterCard**
(No other cards accepted)

_____/_____
Card number Expires

_____
Signature

AAAS Hotel Reservation Form

AAAS Annual Meeting ✦ San Francisco
14–19 January 1989

Send confirmation to:

Name _____
(Last) (First & initial)

Mailing address _____
(Street)

_____
(City/State) (Zip code) (Telephone number)

Other occupant(s) of room: _____ _____
(Name) (Name)

Indicate special housing needs due to a handicap: ☐ Wheelchair-accessible room

☐ Other _____

Charge my major credit card (card type): _____

Card no. _____ Expires _____

Signature _____

■ Reservations must be sent to the San Francisco Hilton Hotel on this official form by **16 December 1988.** Reservations received after this cut-off date are conditional on space availability.
■ If the room rate requested is no longer available, the next available higher rate will be confirmed.
■ Reservation changes and cancellations must be sent directly to the hotel.
■ Rollaway beds or additional adult in room, $20.
■ Children stay free of charge in same room with parents if no extra bed is required.

San Francisco Hilton Hotel Rates

Check appropriate box for type of room desired. Add 11% tax to rates shown.

Choice	Single	Double
Standard	☐ $ 89	☐ $105
Superior	☐ $ 99	☐ $115
Deluxe	☐ $109	☐ $125
Suites	☐ $200 & up	

Arrival date _____ Time _____

Departure date _____ Time _____

Please list definite arrival and departure dates and times. If you will arrive after 6:00 pm, this reservation must be accompanied by a deposit (room rate for one night plus tax); check or major credit card accepted.

Mail to: AAAS Reservations
San Francisco Hilton
1 Hilton Square
San Francisco, CA 94102-2189

1989 GERARD PIEL AWARD

FOR SERVICE TO SCIENCE IN THE CAUSE OF HUMANKIND

Nominations are requested for the first Gerard Piel Award to be presented by AAAS at the 1989 Annual Meeting in San Francisco. The Award, established by the Board of Directors of *Scientific American*, recognizes contribution to the formation of public policy and opinion respecting the wise use of science in the cause of human well-being and fulfillment. It may recognize life work or episodic contributions to such issues as population increase, economic development, poverty and environmental conservation. The prize consists of $10,000 and a medal. Both individuals and organizations are eligible.

No nomination form is required, but all nominations should be typed and should include the following information: nominee's name, address, institutional affiliation and title; a brief biographical resume; and a statement of justification for the nomination. Organizational nominations should include information about the nature, form and work of the organization. All nominations must include the name, address and telephone number of the individual making the nomination.

Nominations, as well as questions about the award, should be addressed to Dr. Albert H. Teich, Head, Office of Public Sector Programs, AAAS, 1333 H Street, N.W., Washington, D.C. 20005. (Telephone 202/326-6600)

Deadline for receipt of nominations is *November 15, 1988.*

cessitates the understanding of geoidal shifts, water volume changes, tectonic movements, and meteorological and dynamical changes through time, as well as the careful evaluation of errors, both systematic and otherwise, in the determination of sea-level position and date.

The book is composed of four types of papers. The first type, consisting of an overview introduction by Michael J. Tooley and a concluding conspectus by Tooley and Ian Shennan, briefly reviews the history of Quaternary sea-level determinations and in particular of the International Geological Correlation Program Project 200, to which this volume is a contribution. Tooley and Shennan point out the importance of the 1953 storm surge in the North Sea and the ongoing debate over global greenhouse gases and projected future acceleration of sea-level rise as stimuli for research. Unfortunately, at times their commentary becomes overly political and gratuitously attacks other workers. Their advocacy of a uniform methodology in sea-level determinations is laudable, but, as they admit, too firm an adherence to a formulaic gathering and synthesis of data can be counterproductive. In general, however, these papers are useful.

Other papers consist of detailed local studies in Rio de Janeiro, by Stephen Ireland, and in the Moray Firth, Scotland, by B. Andrew Haggart. Both authors use the approach advocated by Tooley and Shennan, combining geomorphology, coring, paleobotany, and radiocarbon dating. These are competent studies, but their conclusions should not be hastily extrapolated to surrounding regions, given that local paleogeographic and climatic changes could explain some of the observed fluctuations.

Regional overviews form a third type of papers, which include outstanding syntheses of the North Sea by Shennan and of the Australian region by John Chappell. Shennan's analysis of a regional separation of subsidence and rebound from the regional eustatic signal is a significant advance. I would, however, question the regional significance of individual transgressive and regressive overlaps, because of dating uncertainties, compaction, and other local effects. I also question Shennan's reliance on individual point determinants in creating the wiggling Mörner reference curve. Nevertheless, when these 10^2-year scale fluctuations are factored out, the regional signal comes through loud and clear. Chappell demonstrates the necessity of understanding the precision and accuracy of the data, showing that some points are only unidirectional indicators of sea level and stating that absence of data is no justification for assuming a major regression. In the same group are papers by Paolo A. Pirazzoli on the Mediterranean and by Yoko Ota and Hiroshi Machida on Japan. Both are useful summaries of their regions. The studies on the west and east coasts of Africa, by Pierre Giresse and Lars-Erik Åse, respectively, suffer from a paucity of data. Until more detailed studies are done, regional overviews can contribute little here. Thomas M. Cronin provides an odd perspective on U.S. east coast studies, presenting information selectively and without diagrams or tables. It is perhaps impossible to summarize this heavily studied region in a short space, but the paper is disappointing. On the positive side, the methodology that Cronin advocates is rational. As Oaks and Dubar pointed out in 1974, long-distance geomorphic correlation of sea levels and coastal features is a flawed concept, and even correlation with the oceanic oxygen isotope curves is insufficient. Integration of physical stratigraphy, paleontology, geomorphology, and paleogeographic reconstruction with dating is the needed approach.

The fourth type of papers comprises two models: Nils-Axel Mörner gives a broad perspective on global changes, including geoidal and dynamic effects, and James A. Clark and John A. Primus present a numerical model of effects of ice-sheet melting and corresponding additions of seawater volume in light of postulated climatic warming. Mörner neatly summarizes the history of the growing awareness of geoidal, dynamical, and tectonic effects on sea-level change. His specification of regional versus global eustasy is an important concept, as demonstrated by the Shennan paper discussed above. Unfortunately, many of his assertions about loading, viscosity, and "flexurality" are unsupported. For example, his assertion that a loading of the ocean basin with water will be compensated by subsidence but that unloading will not result in rebound seems to ignore the time scales involved in lithospheric density adjustments over 10^6 to 10^8 years as opposed to glacioeustatic and hydroisostatic adjustments over 10^3 to 10^5 years. In direct contradistinction, Clark and Primus develop a detailed, numerical model of rapid elastic response of the earth to water redistribution that is testable with data from tide gauge and glacial studies. They also point out the correspondence of existing Holocene sea-level records to a model of global glacio- and hydroisostasy, with ongoing late Holocene adjustments explained by viscous

properties of the earth. More complete determination of the viscoelastic solution is needed.

The major contribution of this volume is the clarity of its message: an explicit determination of sources of error in sea-level determinants is required in every study; local, relative sea-level curves are the first step to a regional synthesis; regional eustasy can form a benchmark from which tectonic, isostatic, compaction, dynamic, or other geoidal trends can be determined; there is no "global eustatic" curve, but rather a changing four-dimensional trend surface that can be addressed with sufficient data; and there are compelling societal needs to study sea-level, because of present effects on the world's coastlines and projected trends of future rise in sea levels.

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Frugivorous Reptiles

Gray's Monitor Lizard. WALTER AUFFENBERG. University Presses of Florida, Gainesville, 1988. xii, 419 pp., illus. $39.

The varanid lizards, comprising 36 extant species ranging from 0.3 to 3.0 meters in total length, have long attracted attention as morphological, physiological, and ecological analogues of placental predators, usually without adequate background knowledge. Until 1976, Gray's monitor was known only from two old, puzzling museum specimens, and even its existence was in doubt. During 22 months of fieldwork, the author of this book achieved more than 100,000 contacts with 12 radiotelemetered animals, painstakingly examined more than 125 specimens for a variety of purposes, and also studied other local animals and plants. *Varanus olivaceus* emerges as a large species (total length to 1.75 meters), restricted to small areas in the Philippine Islands, the most frugivorous living lizard, and all the more interesting because several of its congeners are specialized carnivores.

Gray's monitor is a slow-moving, secretive, and very choosy forager, in contrast to most other varanids, with their frenetic behavior and catholic diets. Adults eat mainly the fruits of about ten species of trees, supplemented by land snails during lean times. The fruits tend to be oily, possess features that might enhance seed dispersal by slowing their passage through the gut, and are eaten only on the ground and when freshly ripe. A caecum and other unusual anatomical characteristics are functionally correlated with this peculiar lifestyle. As with many other tropical organisms, the future of Gray's monitor is uncertain, mainly owing to timber harvesting and illegal hunting.

Several blurry pages, a few stylistic inconsistencies, and an apparent publication lag (most references are pre-1984) detract from this book. Specialists will find minor things