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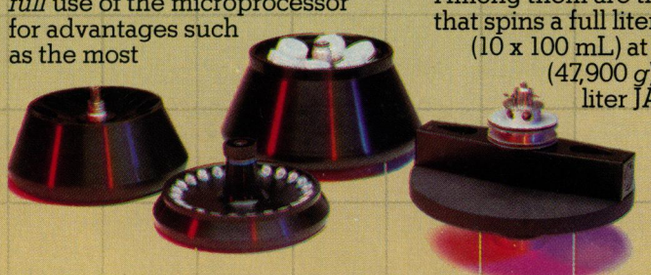

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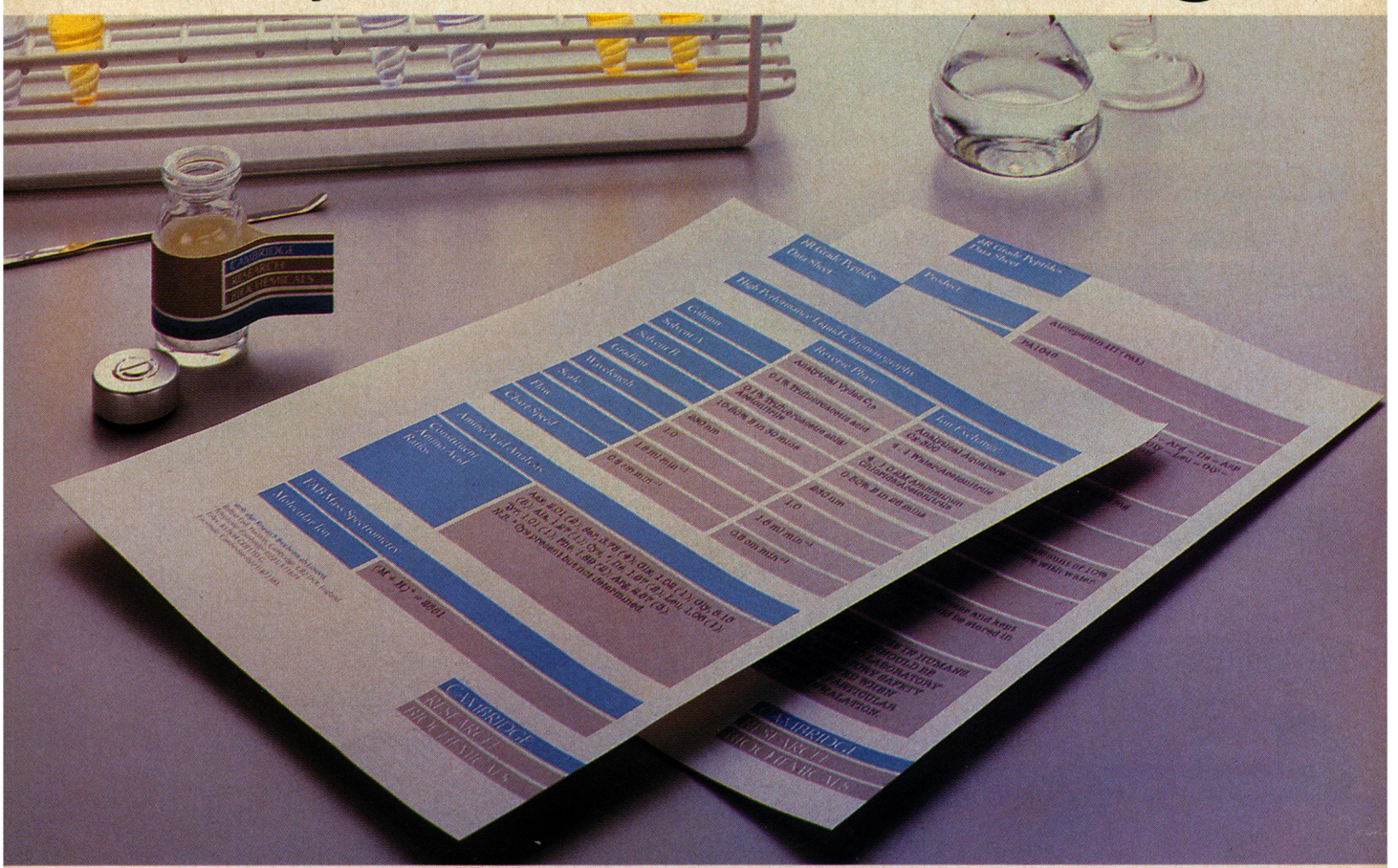

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SCIENCE

ISSN 0036-8075
10 OCTOBER 1986
VOLUME 234
NUMBER 4773

■ **SCIENCE is published weekly on Friday, except the last week in December, and with an extra issue in May 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**® The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): $65. Domestic institutional subscription (51 issues): $98. Foreign postage extra: Canada $24, other (surface mail) $27, air-surface via Amsterdam $65. First class, airmail, school-year, and student rates on request. Single copies $2.50 ($3 by mail); back issues $4 ($4.50 by mail); 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. **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 The Tracking and Data Relay Satellite System (TDRSS), operated for NASA by Spacecom, was used in conjunction with 64-meter radio telescopes in Australia and Japan to perform very long baseline interferometry in space. Using this technique it has been possible to obtain angular resolution equivalent to that of a radio telescope with a diameter 1.4 times the size of the earth. See page 187. [Photograph courtesy of TRW, Inc.]

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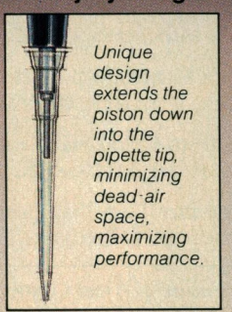

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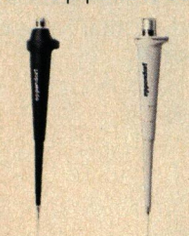

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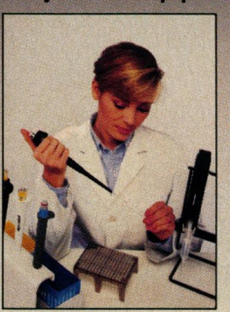

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This Week in
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Protein turnover

How rapidly a protein is degraded depends on what amino acid is positioned at its amino terminus (page 179). Using genetic engineering techniques, Bachmair *et al.* constructed long-lived and short-lived versions of the same protein; site-directed mutagenesis produced changes in only the amino acid of the molecule. The proteins were then made by yeast cells and their half-lives determined. Some terminal amino acids (methionine, serine, alanine, threonine, valine, glycine) conferred a long half-life and others (arginine, lysine, phenylalanine, leucine, aspartic acid) conferred a very short half-life to the molecule. These simple changes in complex molecules can produce profound effects on protein turnover and functioning. Kolata describes the evolution of the experimental approach (page 151).

Fine-tuning detection of cosmic radio sources

In a prototype experiment Levy *et al.* demonstrated the feasibility of using an orbiting radio telescope as one component for very long baseline interferometry (VLBI) studies of cosmic radio sources (page 187). VLBI uses two or more widely separated radio telescopes to pick up signals from distant radio sources; the independently obtained data are then cross-correlated. Earth-based VLBI measurements are limited by the earth's size; by placing one telescope in space (through the use of an orbiting spacecraft) (cover), the length of the baseline (the vector between two telescopes) can be extended. In this experiment a projected baseline of 1.4 earth diameters was achieved. Because the angular resolution is sharpened, better probing of positions, motions, and energy generation in quasars and other cosmic sources is possible, as are better measurements of distances in space. Ideally radioastronomers would launch a dedicated orbiting observatory for use in future VLBI studies.

Lightning, fulgurites, and extinction theories

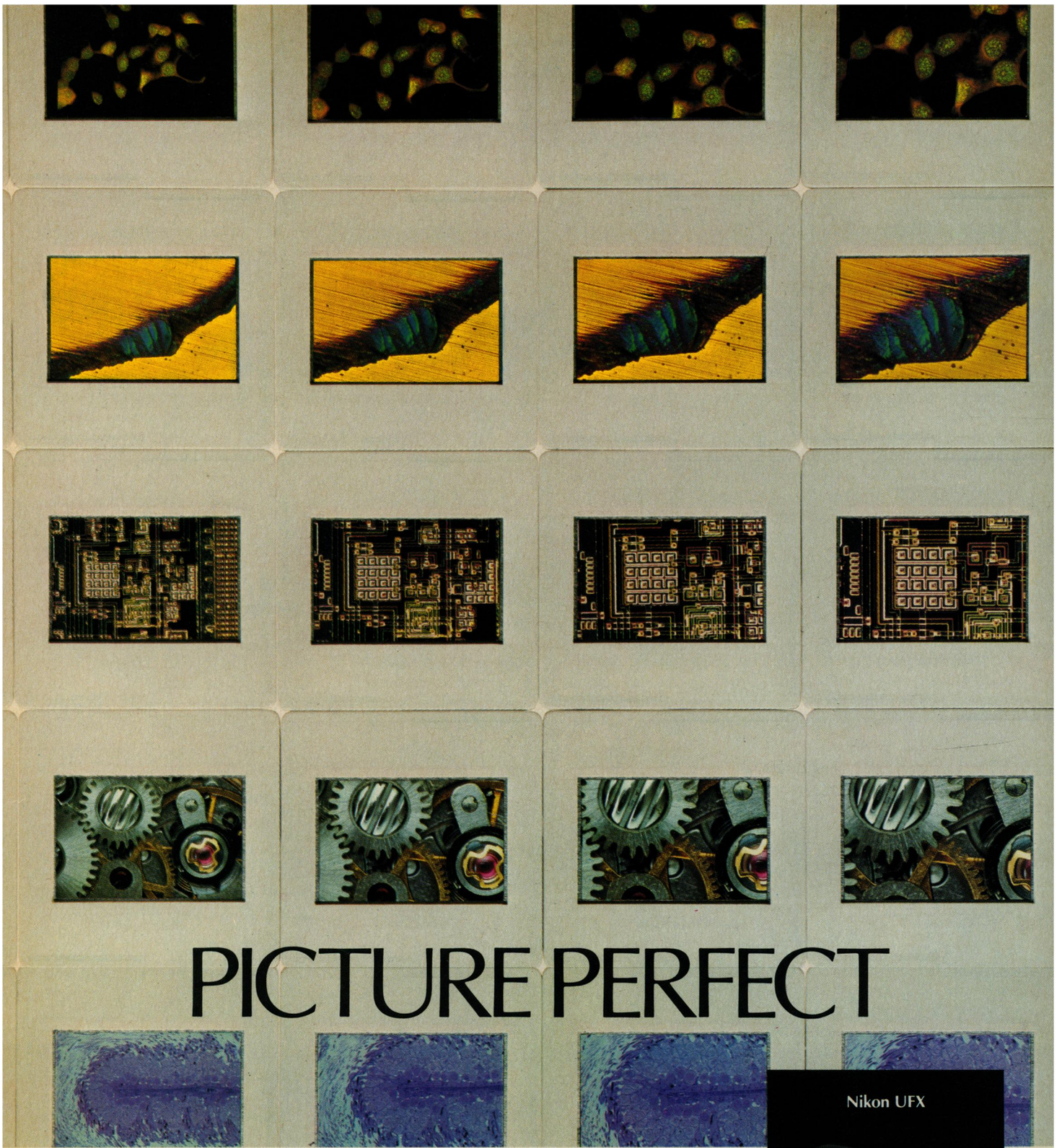
Glassy, tube-like structures called fulgurites can form in sand, rock, or soil when lightning strikes (page 189). They are abundant because lightning hits the earth about 100 times per second. When it does, the air heats to temperatures as high as 30,000 K and large currents are generated. The target materials may melt or vaporize and extreme reducing conditions ensue in the heat. The largest fulgurite known was recently discovered at a site in Michigan; charred new growth on the surrounding vegetation indicated that lightning had struck only a few weeks earlier. The fulgurite consisted of glass, variously colored white, green, and dark gray, fused quartz cobbles, and metallic spheroids rich in elemental silicon. Unusual metals, including several new mineral species, were found in the spheroids. Essene and Fisher suggest that some of the processes associated with lightning strike fusion might also occur, on a vastly larger scale, during impact fusion following collision of a comet or asteroid with the earth. If so, geochemical anomalies found in clays from the Cretaceous/Tertiary boundary—the time of a mass extinction and a proposed impact—might have come not directly from the bolide but from differential distribution of immiscible metallic and silicate phases during the fusion event.

Inhibin and pituitary hormones

Feedback between circulating inhibin (a reproductive hormone produced by the gonads) and follicle-stimulating hormone (FSH) (a pituitary hormone) contributes to regulation of the estrous cycle (page 205). Using antibodies specific for the α chain of inhibin, Rivier *et al.* measured serum levels of inhibin after various experimental manipulations of female rats. The antibodies were also injected into animals to evaluate in vivo effects. When a hormone with long-lasting FSH activity was injected into rats, inhibin increased in the serum. The increase caused FSH secretion to be suppressed. When antibody to inhibin was injected into animals, serum FSH rose but levels of another pituitary hormone, luteinizing hormone (LH), were unaffected. FSH and LH are both responsive to sex steroids and gonadotropin-releasing hormone; only FSH responds to inhibin, and this may explain to some extent why there is incomplete synchrony of FSH and LH secretion during the estrous cycle.

Fossils furnish clues to geographic change

Teeth and jaw fossils of characid fishes (herbivores that ate plants, fruits, and seeds) are indistinguishable from those of living characids; they tell of the evolutionary process (essentially static) of the fishes and of the geographic changes that have shaped the Magdalena River Valley of Colombia, South America, since the Miocene Epoch (about 15 million years ago) (page 208). The Magdalena River has roughly 150 fish species, one-tenth the number found in the neighboring Amazon and Orinoco rivers. Today, characids do not live in the Magdalena River but are found among Amazon and Orinoco faunas; discovery of a fossil characid in the Magdalena region by Lundberg *et al.* suggests that at one time the Amazon, Orinoco, and Magdalena river systems were connected. Since Miocene time, ranges of the Andes Mountains, now impenetrable barriers, have risen and separated the river valleys. A local extinction event in the Magdalena region may then have killed off the characid fishes and other river fauna, and these species were never replaced. Evolution in the region has been slow: only two dozen endemic forms of fishes are living in the Magdalena River, and the fossil record shows that fishes besides the characids as well as some South American turtles have remained essentially unchanged.



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10 OCTOBER 1986
VOLUME 234
NUMBER 4773

Transportation of Hazardous Materials

Almost weekly the national media report another accident involving railroad cars carrying hazardous materials. The adjectives used are lurid, including "deadly." From the attention given the matter, one is led toward the belief that an extremely serious situation has newly developed. Federal records show that, in fact, the safety of railroad transportation of hazardous materials has improved. In the last 5 years, no fatality has occurred directly attributable to railroad transport of hazardous materials.

Responding to a climate of public concern and to congressional urging, the Office of Technology Assessment (OTA) has issued a report entitled, *Transportation of Hazardous Materials*.* In this document, OTA examines the record of the various modes of transportation, including trucks, railroads, and waterborne craft and discusses measures for improving safety. Improvement can come slowly by use of improved technology. It can come quickly by reduction of human error through training and selection.

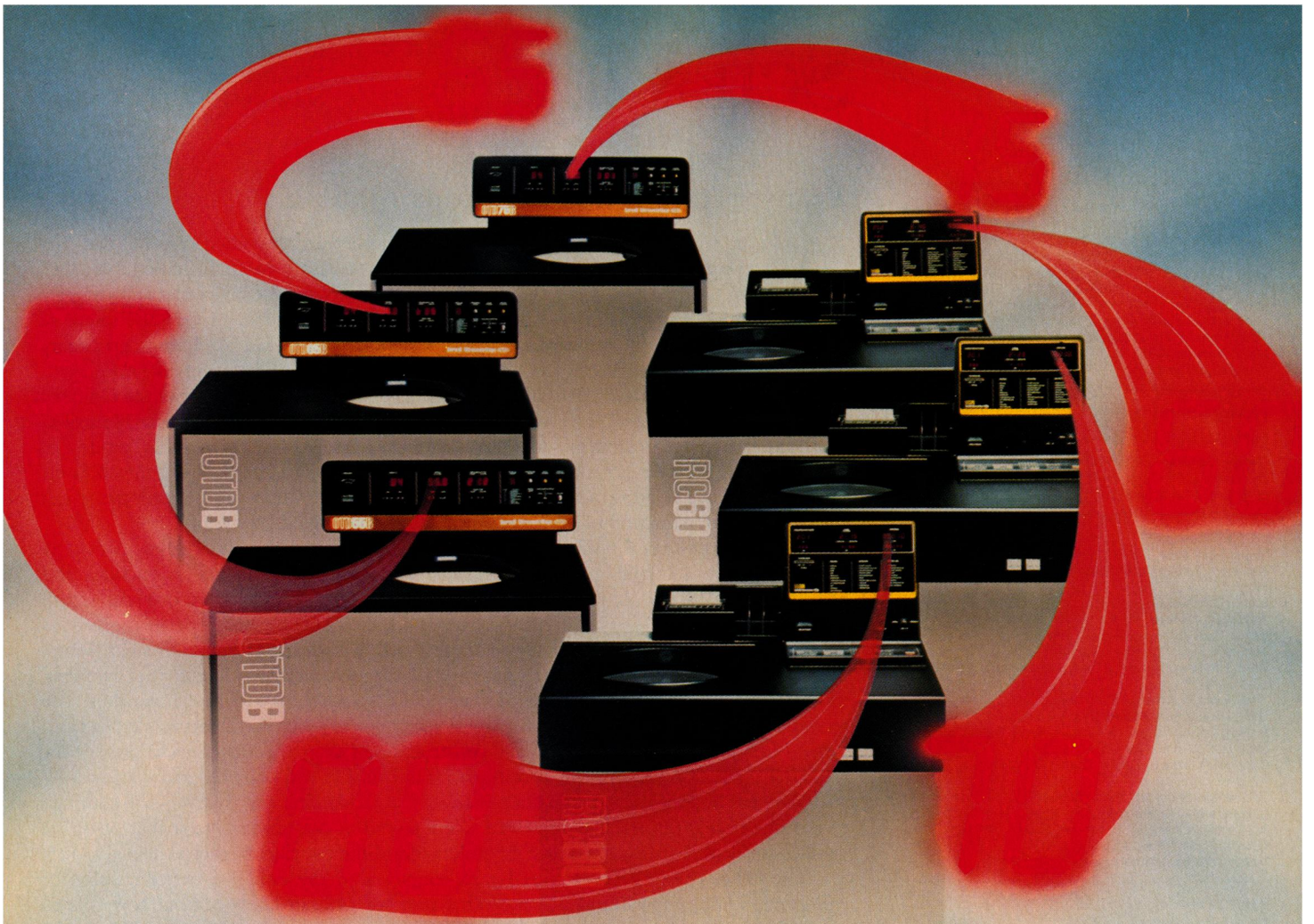
Gasoline transport is responsible for more deaths, injuries, and dollar damages than all other hazardous materials together. Yet state and local transportation restrictions and anxiety are usually aimed at shipments of hazardous wastes or radioactive material, which represent only a tiny fraction of the activity and which have caused little in the way of damage. Public concern about transportation of spent nuclear fuel seems to stem from a deep-seated fear of nuclear energy. Experts in a recent poll concerning 30 activities involving risks ranked nuclear power number 20, but the public ranked it the most hazardous. The record for public fatalities from transport of spent nuclear fuel shipments to date is zero. Behind that record is careful design and construction of shipping containers to provide for radiation protection and extreme contingencies of collision and heat. Engineers know how to design and build a safer gasoline tanker truck, but jackknifing and rollovers will continue to the foreseeable future. The improved safety record of the railroads over that of earlier decades is due to better engineering of tank cars and the couplers between them.

The OTA report devotes considerable emphasis to the need for better training of emergency response personnel. All too often they are without knowledge of how best to respond to an accident involving release of one of many possible substances. The public safety person first at a scene is likely to be one of the nation's 1 million largely untrained volunteer firefighters. He or she may be confronted with a placarded, derailed tank car emitting a cloud that burns the eyes. The volunteer firefighter ". . . probably has not heard that the simplest equipment for dealing with a hazardous materials accident includes tennis shoes and binoculars—tennis shoes to run away and binoculars to read the hazardous materials placard from a distance before calling for expert help." One source of expert help is the Chemical Transportation Emergency Center (CHEMTREC). It maintains an on-line database on the chemical, physical, and toxicological properties of thousands of products. At all times, staff are on duty to provide needed information.

An inappropriate response to an accident involving unfamiliar chemical products can endanger the individuals involved and the surrounding community. Of approximately 2 million people in the emergency response network, OTA estimates that a maximum of 25 percent have received adequate training to meet a hazardous materials emergency. The report recommends initiatives aimed at training trainers.

Most transportation accidents involve trucks and human error such as inattention. A study in the state of Washington showed that 70 percent of truck accidents occurred on a straight path. There is also sufficient doubt about the skills of drivers that the report advocates special driving tests and licenses for truck operators. Additional driver training and improvements in equipment can reduce accident rates. The Shell Oil Company has achieved a 58 percent reduction in rates of preventable accidents through instruction and field training, coupled with the use of automatic tachographic records. The driver knows that his driving behavior is being monitored. He also knows that the records can work to his benefit in case of an unavoidable accident.—PHILIP H. ABELSON

*Office of Technology Assessment, *Transportation of Hazardous Materials* (Government Printing Office, Washington, DC, July 1986).



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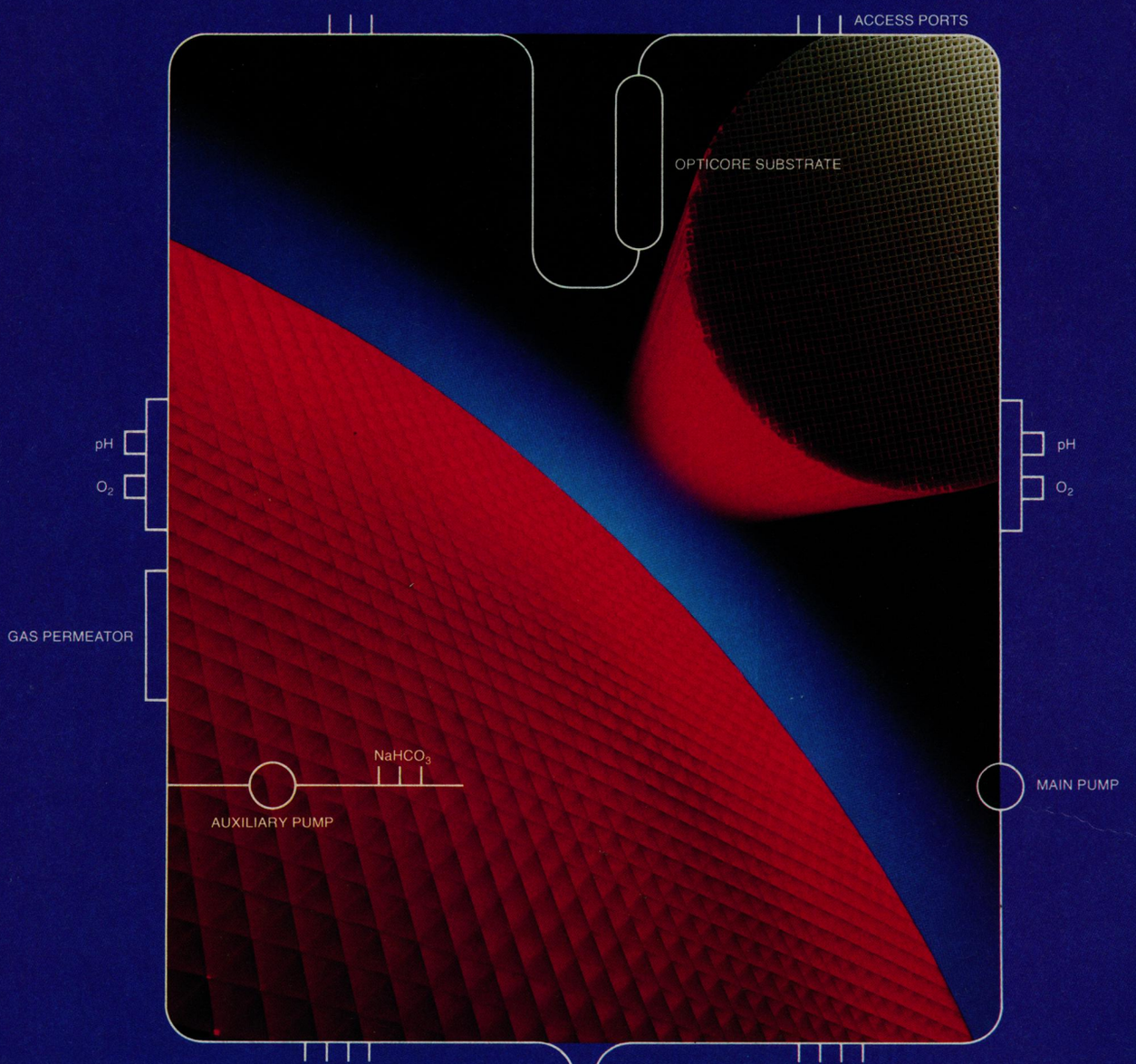

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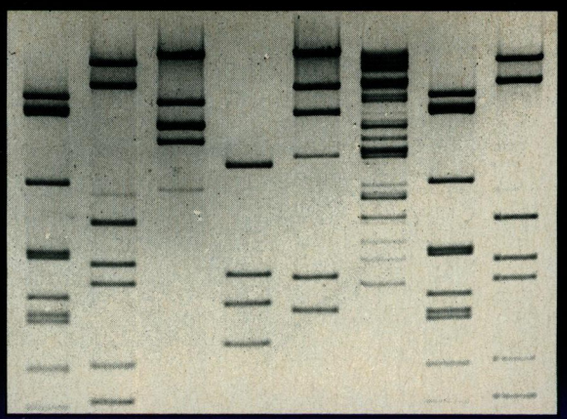

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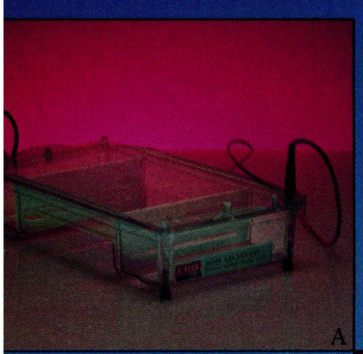
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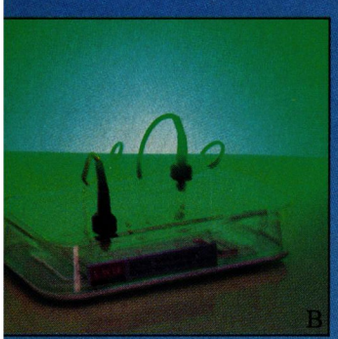
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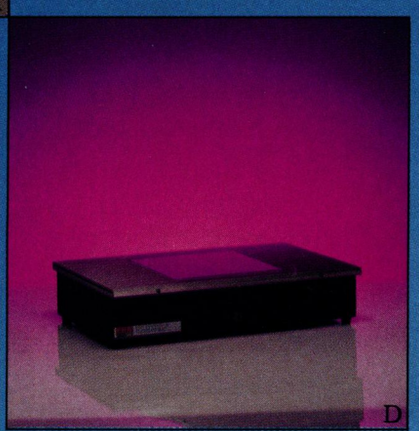
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No longer need you resort to multiple loading with its increased time and greater required sample volumes. Whether for nucleotide separations in agarose gels or sequencing in acrylamide gels, the technique of wedge-shaped field strength gradients lets you get linearly spaced bands for maximum resolution and ease of reading. Two new instrument systems from LKB render the technique rapid, reliable and above all, reproducible.

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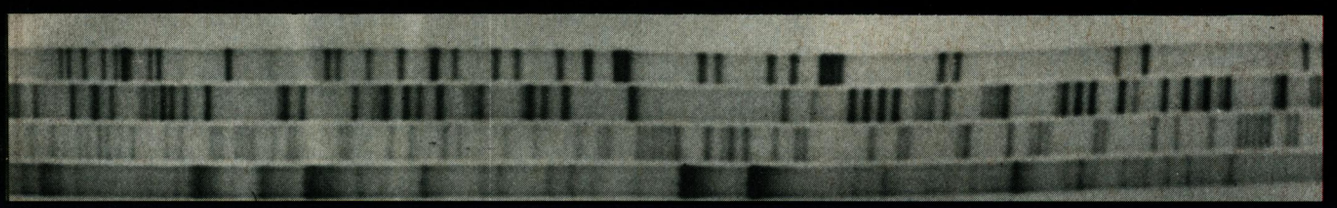

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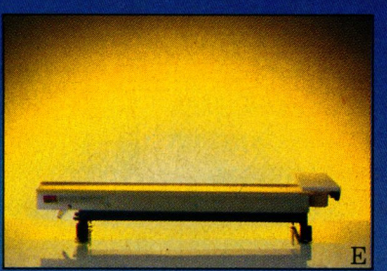
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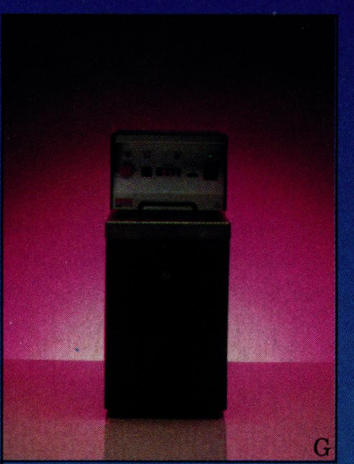
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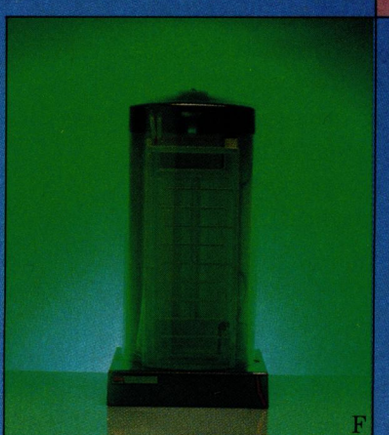
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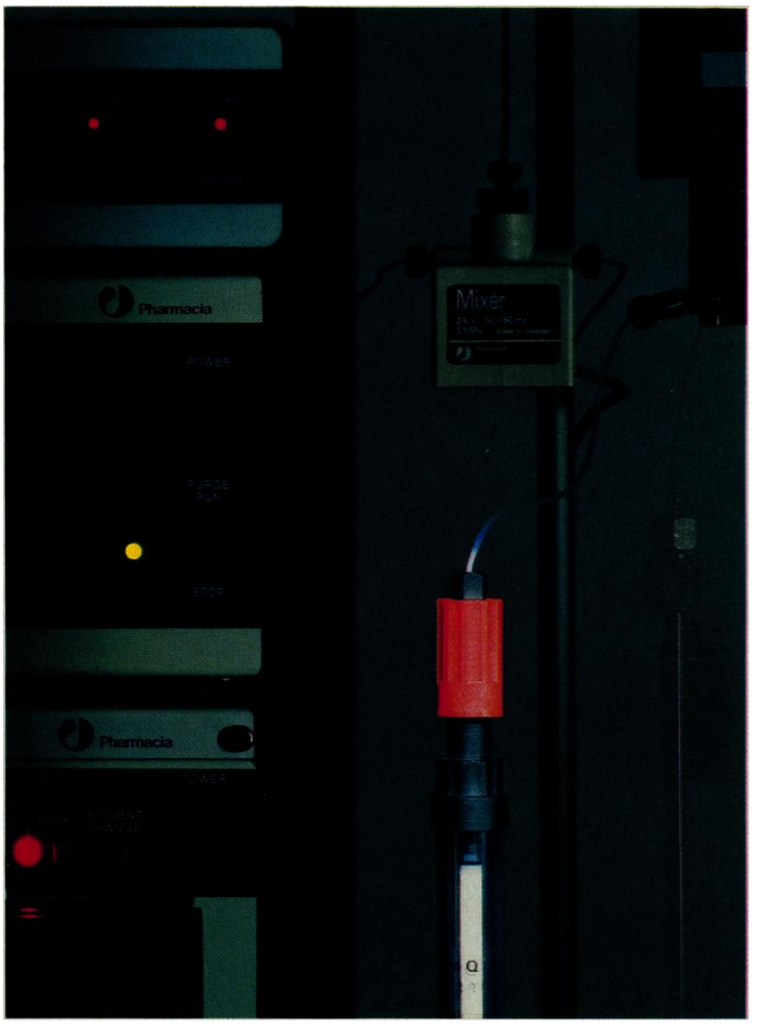

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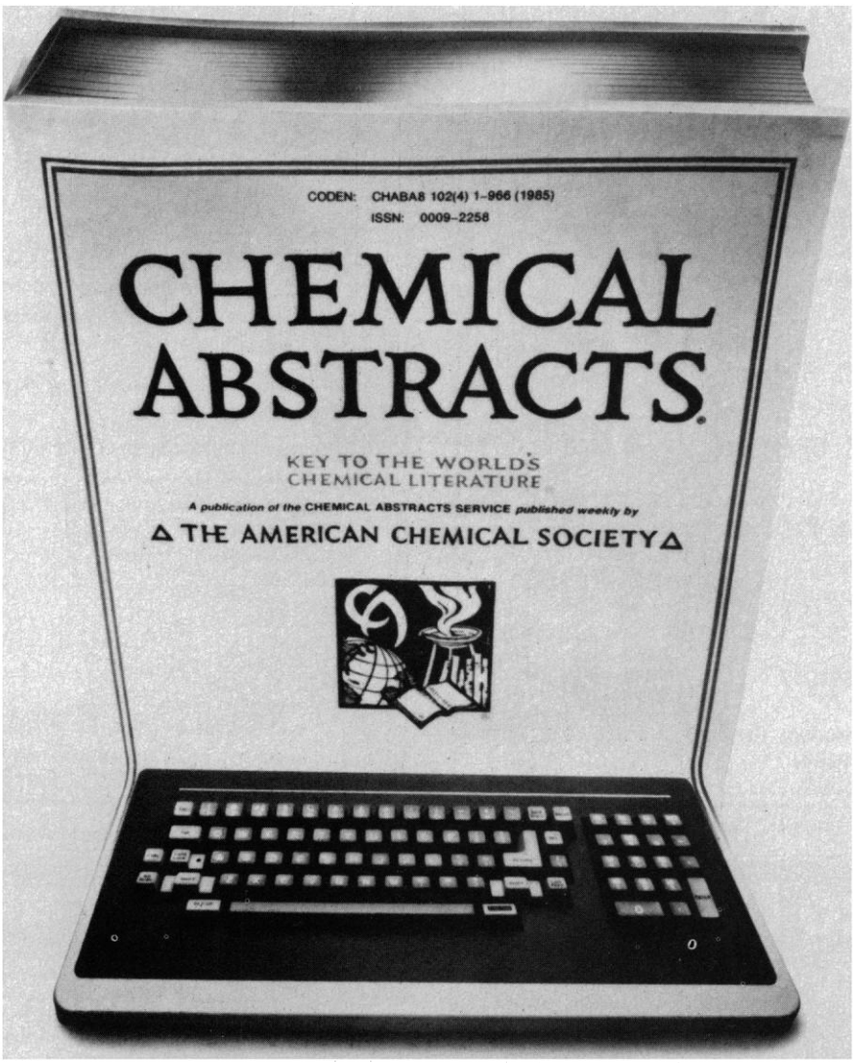

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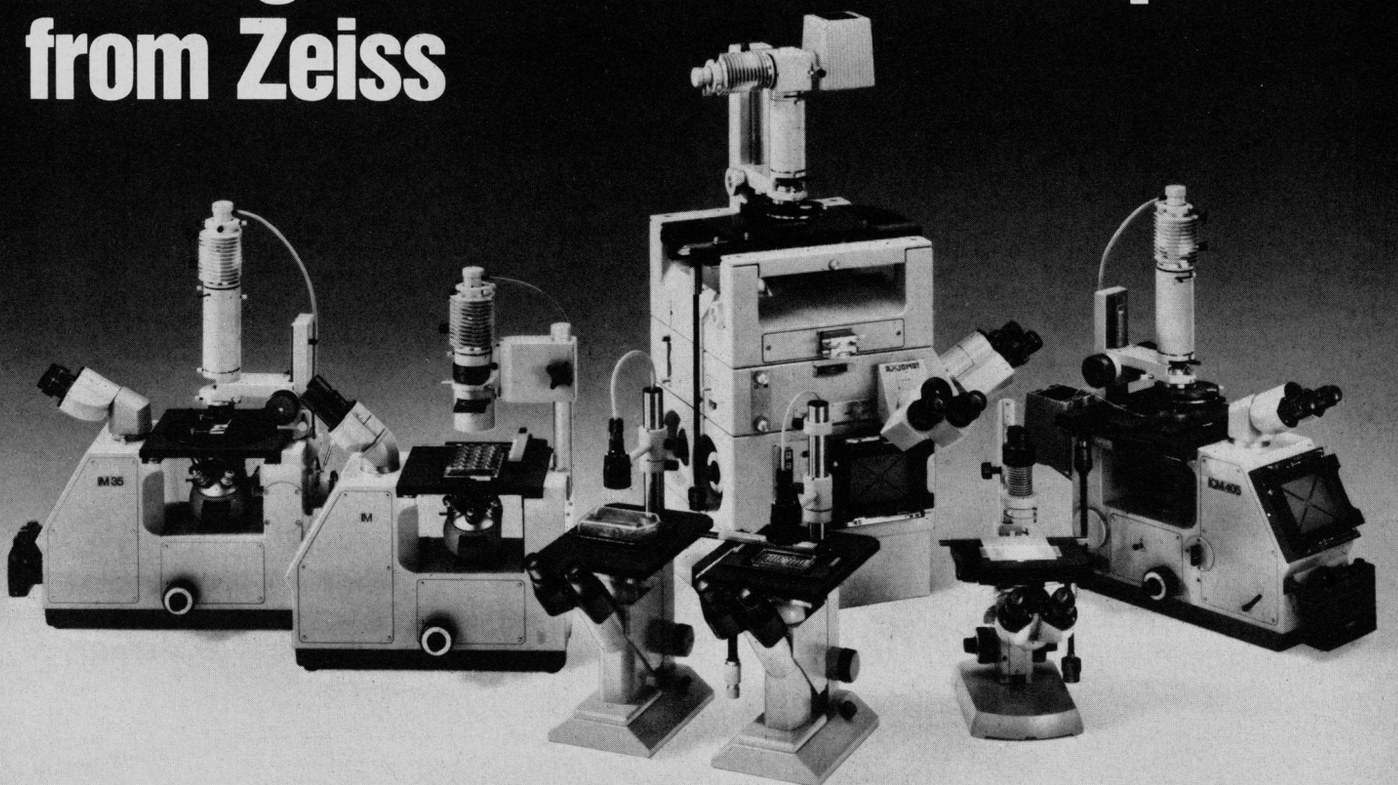

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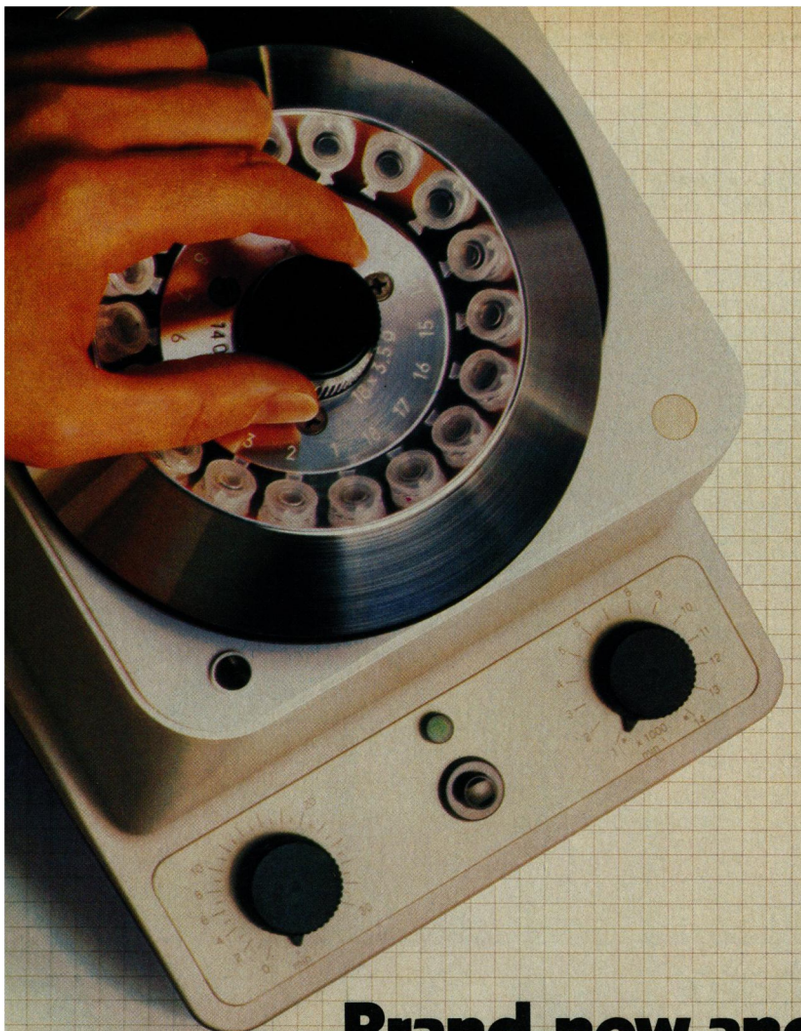

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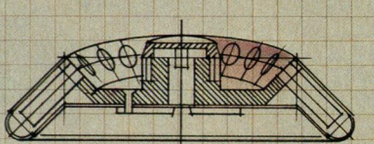

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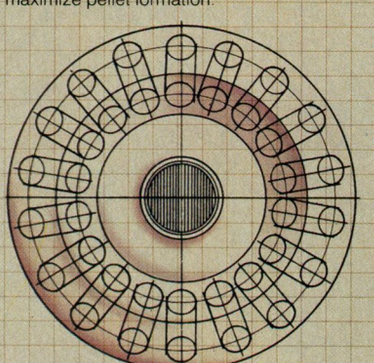

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4 – 5 December 1986

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Packets will be mailed to preregistrants in early November; registrations received after 5 November will be held at the AAAS Registration Desk in the hotel. **Refund Policy:** Advance registration fees and meal tickets will be refunded for cancellations received by 1 December; no refunds will be made on cancellations received after this date.

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Science and Security: The Future of Arms Control

December 4–5, 1986
Shoreham Hotel
Washington, D.C.

Schedule of Events

Thursday, December 4

8:00 **Registration**

9:00 **Welcome.** Rodney W. Nichols, *Chair, Committee on Science, Arms Control, and National Security, AAAS*

9:10-10:45 **An Overview of the Role of Science and Technology In Shaping National Security Policy**

Sidney Drell, *Deputy Director, Stanford Linear Accelerator Center, Stanford University*

William R. Graham, *Director, Office of Science and Technology Policy, Executive Office of the President*

Brent Scowcroft, *Vice President, Kissinger Associates, Inc.*

Rodney W. Nichols, presiding

10:45-11:00 **Break**

11:00-12:30 **Advances in Weapons Technologies and Their Impact on Security**

Lawrence Woodruff, *Deputy Under Secretary for Strategic and Nuclear Systems*

Albert Carnesale, *Professor and Academic Dean, Kennedy School of Government, Harvard University*

William Perry, *former Under Secretary of Defense, current President, H & Q Technology Partners, Inc.*

Admiral Noel Gayler, presiding, *former Director, National Security Agency, current Board Member, Committee on East-West Accord*

12:30-2:00 **Luncheon Address: Technology, the Arms Race, and the U.S.-Soviet Relationship**

Robert S. McNamara, *former Secretary of Defense*

Mildred Dresselhaus, presiding, *Institute Professor, MIT, AAAS Board Member*

2:00-4:30 **SDI: An Evaluation of Its Strategic and Technical Merits**

Franklin Long, *Professor Emeritus of Chemistry, Cornell University*

Nicolaas Bloembergen, *Professor of Physics, Harvard University*

Lt. Gen. James Abrahamson, *Director, Strategic Defense Initiative Organization*

Charles Zraket, presiding, *President, MITRE Corporation*

4:30-4:45 **Break**

4:45-6:00 **Open Forum on Science, Technology, Arms Control and National Security**

A further opportunity for colloquium participants to ask questions of and interact with the day's speakers. Panelists include: Sidney Drell, Brent Scowcroft, Noel Gaylor, Franklin Long, Nicolaas Bloembergen, Rodney W. Nichols, and Charles Zraket.

6:00-7:30 **Reception: All attendees invited**

Friday, December 5

8:00 **Late Registration**

8:00-9:30 **Breakfast Address: Congress, Nuclear Arms Control and Reducing the Risk of War**

Dick Clark, presiding, *Senior Fellow, Aspen Institute for Humanistic Studies*

9:30-10:45 **Technology and "The Five Continent Initiative"**

The Honorable Pierre Schori, *Deputy Foreign Minister, Sweden*

Patricia McFate, presiding, *President, American-Scandinavian Foundation*

10:45-11:00 Break

11:00-12:30 **Smaller Group Sessions**

1) The Problems and Promises of Verification: Can Future Arms Control Agreements be Verified?

Panelists:
Sidney Graybeal, *Vice President, System Planning Corporation*
Kosta Tsipis, *Director, Program on Science and Technology for International Security, MIT*

2) Weapons Testing and Nuclear Weapons Proliferation: Prospects for the Future

Panelists:
Herbert York, *Director, Institute for Global Conflict and Cooperation, University of California, San Diego*

Joseph Nye, *Director, Center for Science and International Affairs, Harvard University*

3) An Assessment of Soviet Strategic Force and Defense Capabilities

Panelists:
Condoleezza Rice, *Hoover Institution*
Jonathan Dean, *former Ambassador; Union of Concerned Scientists*

4) The Scientific Community and Defense Research

Panelists:
Jack Ruina, *Professor of Electrical Engineering, MIT*
Michael May, *Associate Director, Livermore Laboratory*

5) Command, Control, Communications, Intelligence (C^3I) and Nuclear Stability

Panelists:
Ashton Carter, *Associate Director, Center for Science and International Affairs*
Charles Zraket, *President, MITRE Corporation*

12:45-2:30 **Luncheon Address: A Vision for the Future: How Science and Technology Can Help Us Create a More Secure and Peaceful World**

David Hamburg, *President, Carnegie Corporation of New York*

Joseph Nye, presiding, *Director, Center for Science and International Affairs, Harvard University*

2:30 **Adjourn**

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