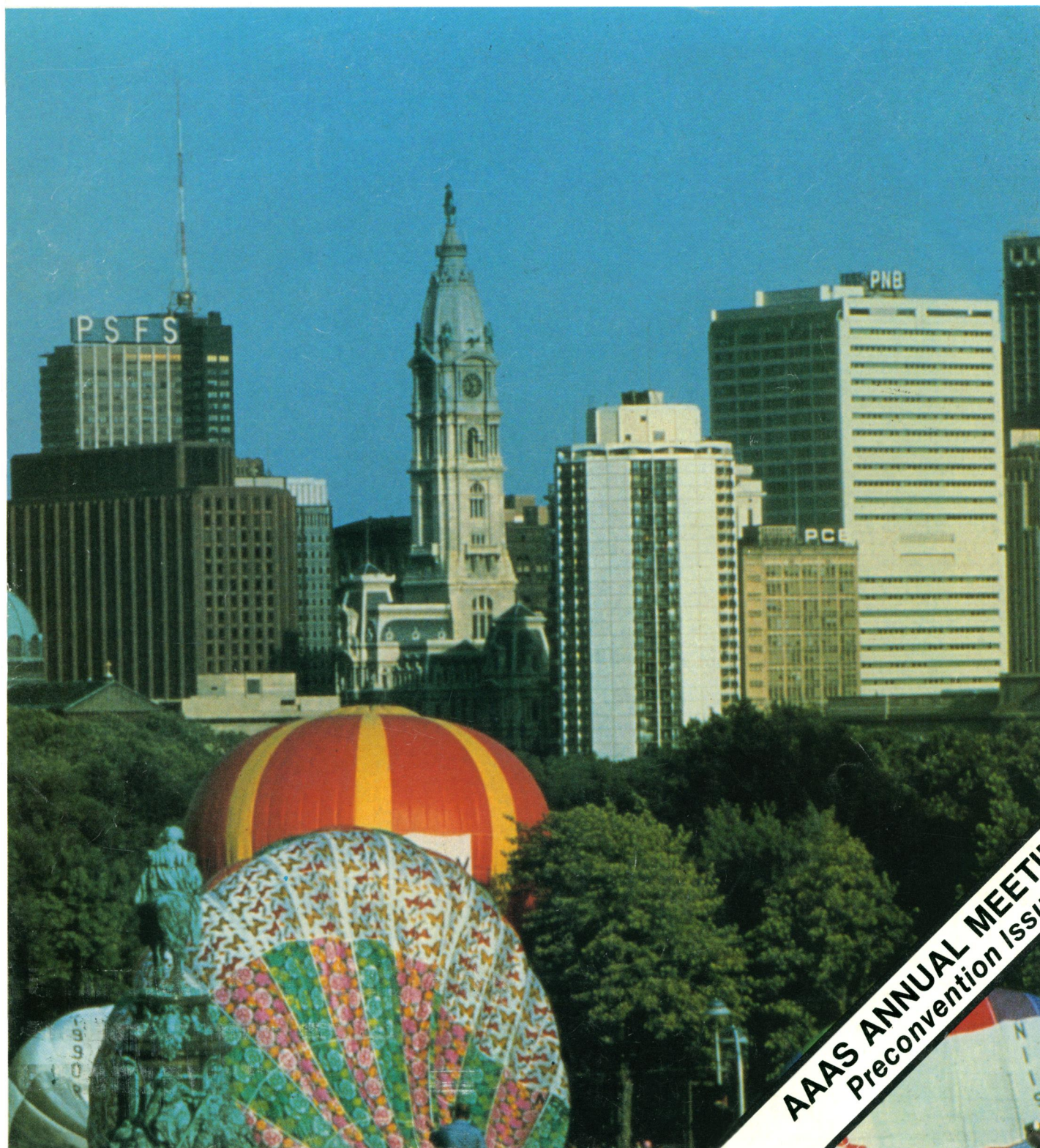


AMERICAN  
ASSOCIATION FOR THE  
ADVANCEMENT OF  
SCIENCE

# SCIENCE

28 MARCH 1986  
VOL. 231 ■ PAGES 1481-1632

\$2.50



**AAAS ANNUAL MEETING**  
Preconvention Issue



# DNA Synthesis Made Easy

The System 1 Plus DNA Synthesizer is the latest advancement in DNA synthesis. It uses the popular IBM-PC as its interactive graphic controller, and makes the synthesis of single-stranded DNA easier than ever before. Even operators unfamiliar with DNA synthesis can move smoothly through the program.

## Easy Sequence Entry

Computer keyboard or light pen can be used to quickly enter sequences in the 5' to 3' direction. As bases are selected they appear on the screen, color-coded and with proper codon breaks to

simplify proofing and editing. Up to 102 bases can be programmed for long unattended operation.

## Simple Interactive Graphics

If a sequence is entered that is too long for available reagents, the BOTTLE STATUS screen shows which reservoirs need to be filled. Pump flow rates can be changed and synthesis steps can be altered from the standard program using PROGRAM ADJUST. At any time SYSTEM STATUS can be accessed for real-time display of synthesis conditions.

Once synthesis has begun, you can use the IBM-PC for

other applications, confident that synthesis will continue as desired. The Coupling Efficiency Monitor assures complete deblocking and coupling at every step.

## Simple to Buy

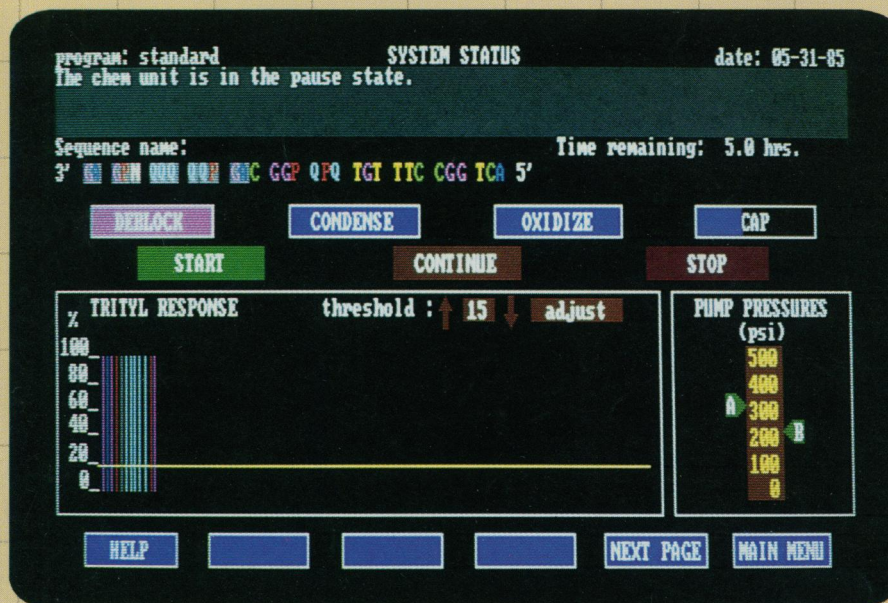
System 1 Plus makes DNA synthesis easy, with repetitive yields greater than 98%, less than 15-minute cycles, and low operating costs. Beckman makes it easy to purchase with an introductory package that will surprise you. Ask your Beckman representative for details, or write: Beckman Instruments, Inc., 1050 Page Mill Road, Palo Alto, CA 94304.

The system status screen is used to start a synthesis, and can be easily accessed at any time.

It displays the sequence entered, with the current base position highlighted.

Color-coded lines give an immediate graphic display of coupling efficiency and selected threshold level is indicated.

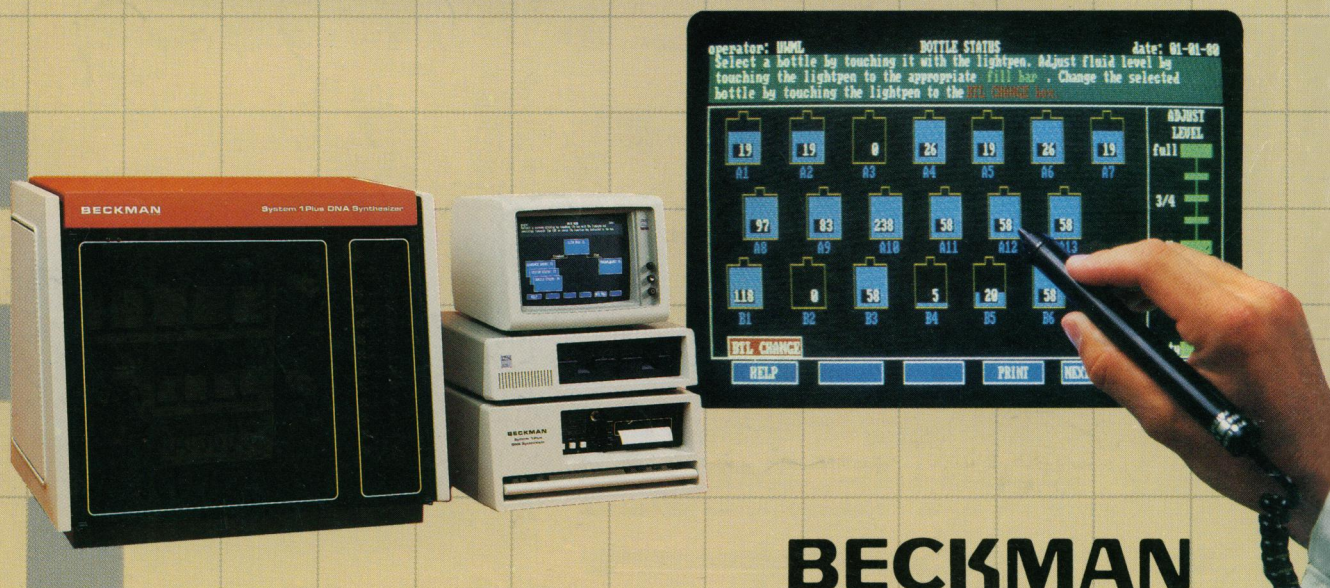
Help is always available simply by touching this box.



Time remaining in the synthesis is indicated to the minute.

As deblocking, condensation, oxidation, and capping occur, these boxes fill with color to match the base being added.

The screen indicates pressures of the time-proven, low-maintenance HPLC metering pumps, which are used for precise chemical delivery.



# BECKMAN

Circle No. 94 on Readers' Service Card



## **A 6,000 V Constant Power Supply with Unequalled Versatility for Electrophoresis Work**

The new E-C Quantum 650 delivers so many constant power options you may never need to buy another power supply. High voltage range (6,000 V) for DNA sequencing, HV isoelectric focusing, other advanced work. Low voltage range (2,000 V) for multiple SDS gels, general electrophoresis, electroblotting, immunoassays. Constant power to 200 W. Constant voltage to 6,000 V. Constant current to 350 mA.

Four power outlets let you run up to four procedures simultaneously. Digital LED readout. Automatic 3-mode crossover. Full E-C safety features. Adaptability to any E-C or similar cell. Only \$2,495 f.o.b. St. Petersburg, FL.

To place an order or obtain more information, call Technical Service collect at 800-624-2232 (in Florida 800-282-7932). Or write E-C Apparatus Corporation, 3831 Tyrone Boulevard N., St. Petersburg, FL 33709. Telex: 51-4376 HALA.

Order an E-C Quantum 650 through June 1986, get a free plug-in Digital Run Timer.



# **Announcing the E-C Quantum 650**

Circle No. 154 on Readers' Service Card

1487 This Week in *Science*

## Editorial

1489 Global Economic Competition

## Letters

1490 Punctuated Equilibrium: J. LEVINTON ■ The Future of U.S. Agriculture:  
R. WILES; W. W. KELLOGG; D. PIMENTEL, M. PIMENTEL; D. T. AVERY

## News & Comment

1493 A Revisionist Look at Population and Growth ■ Environment and Development  
1495 Experts Ponder Effect of Pressures on Shuttle Blowup ■ Flight Rate Pressures ■  
NASA Faces Budget Crunch  
1498 NAE Elects New Members  
1499 *Briefing*: The Renewed Trade War Over Japanese Chips ■ Bitter Residue from  
Archeology Congress ■ Academy Study Dispels Doubt on Acid Rain ■ Institute  
of Medicine Launches Assessment of AIDS Programs ■ Nuclear Reprocessing  
and "the World's Most Radioactive Sea" ■ Fuqua Biotech Bill Sets Stage for  
Industry Debate ■ Abattoir-Turned-Museum Opens for Halley's Encounter

## Research News

1502 Giotto Finds a Big Black Snowball at Halley  
1504 First Image from SPOT  
1504 *Briefing*: AIDS Drug Shows Promise in Preliminary Clinical Trial ■ Fetal Mini-  
Brain in Peripheral Nerve  
1506 Solving Knotty Problems in Math and Biology

## Articles

1515 Cell Line Segregation During Peripheral Nervous System Ontogeny:  
N. M. LE DOUARIN  
1522 Elementary Particle Physics and the Superconducting Super Collider: C. QUIGG  
and R. F. SCHWITTERS  
1528 Biological Extinction in Earth History: D. M. RAUP

## Research Articles

1534 Heterogeneous Nuclear Ribonucleoproteins: Role in RNA Splicing: Y. D. CHOI,  
P. J. GRABOWSKI, P. A. SHARP, G. DREYFUSS

## Reports

1540 Acid Dissolution Experiments: Carbonates and the 6.8-Micrometer Bands in  
Interplanetary Dust Particles: S. A. SANDFORD  
1542 Cometary Particles: Thin Sectioning and Electron Beam Analysis: J. P. BRADLEY  
and D. E. BROWNLEE  
1544 A Carbonate-Rich, Hydrated, Interplanetary Dust Particle: Possible Residue from  
Protostellar Clouds: K. TOMEOKA and P. B. BUSECK  
1546 A New HTLV-III/LAV Protein Encoded by a Gene Found in Cytopathic  
Retroviruses: T.-H. LEE, J. E. COLIGAN, J. S. ALLAN, M. F. McLANE,  
J. E. GROOPMAN, M. ESSEX  
1549 Replicative and Cytopathic Potential of HTLV-III/LAV with *sor* Gene Deletions:  
J. SODROSKI, W. C. GOH, C. ROSEN, A. TARTAR, D. PORTETELLE, A. BURNY,  
A. HASELTINE

■ **SCIENCE** is published weekly on Friday, except the last week in December, 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**® Copyright © 1986 by the American Association for the Advancement of Science. Domestic individual membership and subscription (51 issues): \$60. 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. **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.

■ The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.





COVER Philadelphia, Pennsylvania, site of the 1986 AAAS Annual Meeting, 25-30 May 1986. See page 1586 for details. [Photo courtesy of Philadelphia Convention & Visitors Bureau]

- 1553 Identification of HTLV-III/LAV *src* Gene Product and Detection of Antibodies in Human Sera: N. C. KAN, G. FRANCHINI, F. WONG-STAAAL, G. C. DUBOIS, W. G. ROBEY, J. A. LAUTENBERGER, T. S. PAPAS
- 1556 Antiserum to a Synthetic Peptide Recognizes the HTLV-III Envelope Glycoprotein: R. C. KENNEDY, R. D. HENKEL, D. PAULETTI, J. S. ALLAN, T. H. LEE, M. ESSEX, G. R. DREESMAN
- 1559 Platelet Membrane Glycoprotein IIb/IIIa: Member of a Family of Agr-Gly-Asp-Specific Adhesion Receptors: R. PYTELA, M. D. PIERSCHBACHER, M. H. GINSBERG, E. F. PLOW, E. RUOSLAHTI
- 1562 Distribution of Protein and RNA in the 30S Ribosomal Subunit: V. RAMAKRISHNAN
- 1564 Calcium Channels in Planar Lipid Bilayers: Insights into Mechanisms of Ion Permeation and Gating: R. L. ROSENBERG, P. HESS, J. P. REEVES, H. SMILOWITZ, R. W. TSIEH
- 1567 Nucleotide Sequence of SRV-1, a Type D Simian Acquired Immune Deficiency Syndrome Retrovirus: M. D. POWER, P. A. MARX, M. L. BRYANT, M. B. GARDNER, P. J. BARR, P. A. LUCIW
- 1572 Inhibition of Vasopressin Action by Atrial Natriuretic Factor: M. A. DILLINGHAM and R. J. ANDERSON
- 1574 Tissue-Specific Expression in Transgenic Mice of a Fused Gene Containing RSV Terminal Sequences: P. A. OVERBEEK, S.-P. LAI, K. R. VAN QUILL, H. WESTPHAL
- 1577 Autolytic Processing of Dimeric Plant Virus Satellite RNA: G. A. PRODY, J. T. BAKOS, J. M. BUZAYAN, I. R. SCHNEIDER, G. BRUENING
- 1580 HTLV-III *gag* Protein Is Processed in Yeast Cells by the Virus *pol*-Protease: R. A. KRAMER, M. D. SCHABER, A. M. SKALKA, K. GANGULY, F. WONG-STAAAL, E. P. REDDY
- 1584 Human  $\beta$ -Adrenoreceptors: Relation of Myocardial and Lymphocyte  $\beta$ -Adrenoreceptor Density: O.-E. BRODDE, R. KRETSCH, K. IKEZONO, H.-R. ZERKOWSKI, J. C. REIDEMEISTER

## AAAS Meetings

- 1586 *Annual Meeting*: Welcome to Philadelphia; Preconvention Program; Tours; Science & Technology Exhibition; Meeting Information; Registration & Reservation Forms; Call for Symposium Proposals

## Book Reviews

- 1610 Neurobiology of Arachnids, *reviewed by* N. J. STRAUSFELD ■ Gulls and Plovers, R. YDENBERG ■ Gentlemen of Science, M. RUDWICK ■ Books Received

## Products & Materials

- 1612 Peptide and Protein Separation ■ Electron Detector ■ Analyzer for Thiols and Disulfides ■ Incubation Tray ■ Rodent Surgery ■ Shaker Platform ■ Micropositioning Unit ■ Literature

### Board of Directors

David A. Hamburg  
*Retiring President,  
Chairman*  
Gerard Piel  
*President*  
Lawrence Bogorad  
*President-elect*

Robert McC. Adams  
Robert W. Berliner  
Mildred Dresselhaus  
Donald N. Langenberg  
Dorothy Nelkin  
John E. Sawyer  
Shelia E. Widnall  
Linda S. Wilson  
William T. Golden  
*Treasurer*  
William D. Carey  
*Executive Officer*

### Editorial Board

David Baltimore  
William F. Brinkman  
Ansley J. Coale  
Joseph L. Goldstein  
James D. Idol, Jr.  
Leon Knopoff  
Seymour Lipset  
Walter Massey  
Oliver E. Nelson  
Allen Newell  
Ruth Patrick  
David V. Ragone  
Vera C. Rubin  
Howard E. Simmons  
Solomon H. Snyder  
Robert M. Solow

### Board of Reviewing Editors

Qais Al-Awqati  
James P. Allison  
Luis W. Alvarez  
Don L. Anderson  
Kenneth J. Arrow  
C. Paul Bianchi  
Elizabeth H. Blackburn  
Floyd E. Bloom  
Charles R. Cantor  
James H. Clark  
Bruce F. Eldridge  
Stanley Falkow  
Douglas J. Futuyma

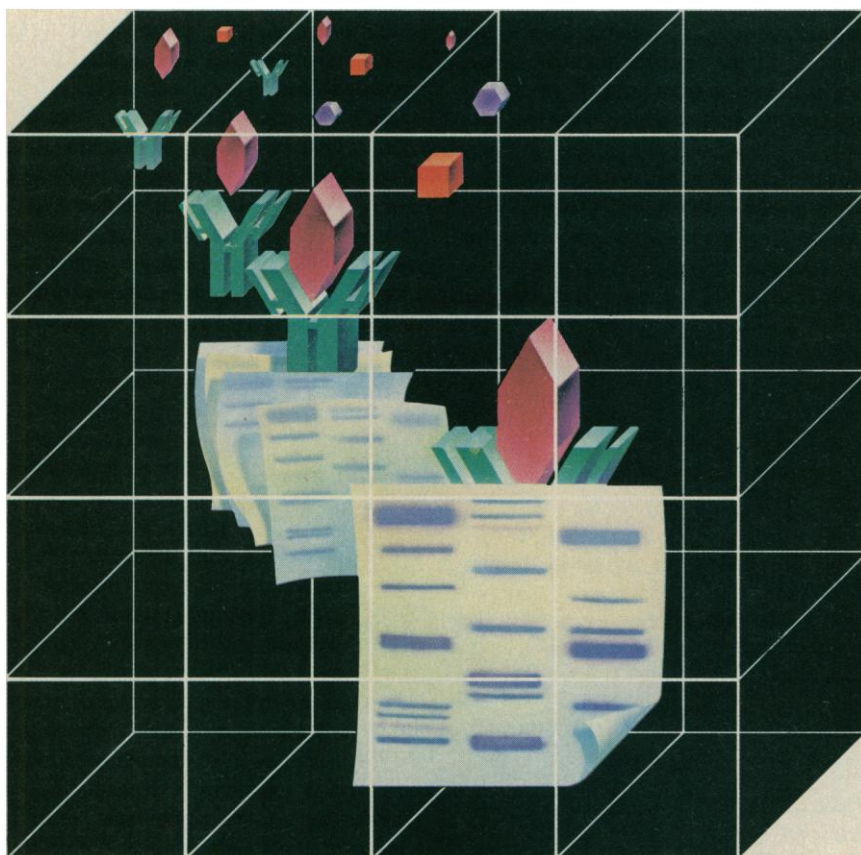
Theodore H. Geballe  
Roger I. M. Glass  
Stephen P. Goff  
Robert B. Goldberg  
Patricia S. Goldman-Rakic  
Richard M. Held  
Gloria Heppner  
Eric F. Johnson  
Konrad B. Krauskopf  
Joseph B. Martin  
John C. McGiff  
Alton Meister  
Mortimer Mishkin  
John S. Pearce  
Yeshayau Pocker  
Frederic M. Richards  
James E. Rothman

Ronald H. Schwartz  
Otto T. Solbrig  
Robert T. N. Tjian  
Virginia Trimble  
Geerat J. Vermeij  
Martin G. Weigert  
George M. Whitesides  
William B. Wood  
Harriet Zuckerman



# Now-A Superior Western Blotting System from Promega Biotec

## ProtoBlot™ Immunoblotting System



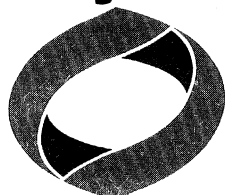
- Alkaline Phosphatase-based detection system:
  - Eliminates the need for radioactive isotopes
  - Provides greater sensitivity than Protein A or HRP-based systems
- Reproducible, reliable performance
- Protein detection in as little as two hours
- Systems available for the detection of Mouse, Rabbit and Human antibodies
- All essential components plus easy-to-use protocols—Promega-Qualified for Western blotting
- Call toll-free to place an order or to receive additional information on the ProtoBlot Immunoblotting System

### Ordering Information Cat. #

Each system contains enough reagents to process at least ten 15 x 15cm filters

ProtoBlot Immunoblotting System, Human	P3910
ProtoBlot Immunoblotting System, Mouse	P3920
ProtoBlot Immunoblotting System, Rabbit	P3930

**Promega Biotec**



**800-356-9526**

Call toll-free to receive our catalog and more information about our complete selection of molecular biological products.

**United States:** Products may be ordered from either Promega Biotec or your Fisher Scientific Branch.

**Canada:** BIO/CAN SCIENTIFIC INC., call toll free 1-800-387-8125.

Circle No. 202 on Readers' Service Card

**Promega Biotec**

2800 S. Fish Hatchery Road  
Madison, WI 53711 U.S.A.

Toll Free 800-356-9526

Telephone 608-274-4330

TW/X/Telex 910-286-2738



## This Week in SCIENCE

### Biologic extinctions

**B**ILLIONS of species of plants and animals have lived on the earth, but only a few million species are alive today; extinction thus looms as an inevitable feature of "life" (page 1528). Extinctions take place all the time, but there also have been numerous episodes of extinctions that have defined the boundaries of geologic time periods: mass extinctions that wiped out a significant percentage of extant species and smaller clusters of extinctions that were not as catastrophic. Extinctions tend to be selective either in the positive Darwinian sense or not. Yet, for any one species, survival or extinction depends on a balance among such variables as biologic status (for example, predation), fragility in the face of environmental stresses (such as global cooling or warming or changes in sea level), and response to terrestrial consequences (fires, fallout) of extraterrestrial bodies (bolides). Raup discusses extinction theories, how examination of the outcome of an extinction event may help in deducing its cause, how paleontologic data both record and misrepresent extinction events (species could migrate away or not be preserved), and how extinctions have helped shape the earth's biologic profile.

### Slices of cometary debris

**S**OME of the particles collected in the stratosphere by U-2 aircraft may be the debris of comets (page 1542). Sizable cometary particles cannot be collected on the earth. In the breakup of a comet, volatile ices would be lost and the fragments would become highly porous; large pieces would not survive entry into the atmosphere. Bradley and Brownlee prepared thin sections of particles (as many as 200 slices can be made from a 10-micrometer particle) collected in the stratosphere and examined the samples with a scanning transmission electron microscope. Some of the micrometeorites fulfilled expectations for cometary debris: they were highly porous, fragile aggregates.

They contained solar-flare nuclear tracks, showing that they had existed in space as small independent bodies. Porous particles such as these are probably similar physically to those encountered during the Comet Halley fly bys and may be carrying with them a record of the primordial processes that occurred during formation of the solar system.

### Carbonates in the cosmos

**S**IMILAR infrared spectra characterize interplanetary dust particles (IDP) composed of layer-lattice silicates and a protostellar object (W33 A) that is thought to be a solar system in the process of formation (pages 1540 and 1544). Both have a major infrared band at 6.8 micrometers that may represent carbonates and an accompanying band at 11.4  $\mu\text{m}$ , also part of the carbonate signature. Sandford subjected an IDP, Calrissian Two (a particle 20  $\mu\text{m}$  in diameter with a mass of about 10 nanograms), to acid treatment; most of its 6.8- $\mu\text{m}$  band disappeared as predicted for (acid-soluble) carbonates. The small bands in this spectral region that remained after acid treatment may represent hydrocarbons that are acid-insoluble in meteorites. Using transmission electron microscopy electron diffraction, Tomeoka and Buseck confirmed the presence of abundant magnesium-iron carbonates in a related IDP, Calrissian. The presence of carbonates in IDP's and, by extension, in interstellar dust opens a window onto processes that took place in the past (IDP's) and that are taking place now (W33 A) in solar system formation.

### Another AIDS protein identified

**I**N the continuing search for clues as to how the AIDS virus produces disease, attention has focused on the activities of viral genes and their products (pages 1546, 1549, and 1553). Besides the characteristic retroviral genes *gag*, *pol*, and *env*, the AIDS virus contains an unusual gene, *sor*

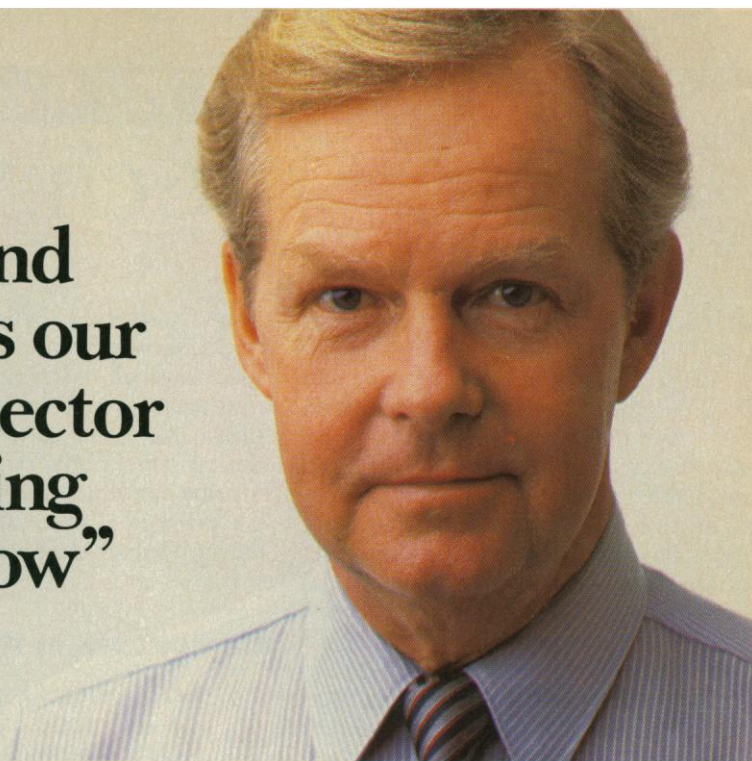
(short open reading frame), positioned in the DNA between *pol* and *env*. The *sor* gene produces a protein that has now been identified and studied in three different systems: the 23,000-dalton protein (p23) was secreted in large amounts by a bacterial expression system developed by Kan *et al.*; it was identified by Lee *et al.* in a cell line infected with the AIDS virus; and its obligate association with the *sor* gene was shown by Sodroski *et al.*, using cloned AIDS proviruses with gene deletions in the *sor* region. Serologic analyses indicated that the *sor* gene produces p23 during the normal course of AIDS infection since antibodies to the protein were present in AIDS patients. (Antibodies were also present in some controls, suggesting that the viral protein may cross-react with proteins unrelated to AIDS.) A role for *sor* has yet to be found: it proved unnecessary for either the replication of the AIDS virus in a cell line or for the cytopathologic effects of the virus on the cells in which it was growing.

### Calcium channel dynamics

**A**RTIFICIAL membranes containing calcium channels—the ion conduits through membranes that are crucial for muscular contraction, neurotransmission, and secretion—are being used to study channel dynamics (page 1564). Rosenberg *et al.* found that when heart calcium channels were incorporated into planar lipid bilayers, they functioned just as they did in intact heart muscle cells: gating (opening and closing) and ion flux showed characteristic dependencies on voltage. Calcium channels from heart muscle cells had different gating and conductance properties from those of skeletal muscle cells despite shared drug sensitivities. The system will be useful for studying channels that cannot be evaluated in intact cells, for measuring channel responses to ionic conditions that are too extreme to be applied to intact cells, and for determining how and which cellular and membrane molecules affect electrical conductance.



"Give me 20 $\mu$ l  
of your sample and  
in just 20 minutes our  
Diode Array Detector  
tells you everything  
you'll want to know"



Talk to anyone who's using diode array detection from LKB, and you'll find he's getting a lot more work done in a lot less time. After all, variable wavelength detection needs a lot of runs to get the kind of information you can trust. And when you're scanning under stopped flow conditions, you can't quantitate peaks and fast LC is almost impossible.

### The Diode Array Detector that just can't miss peaks

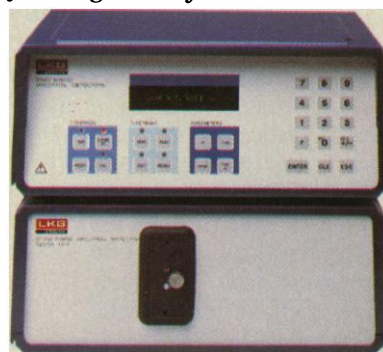
That's LKB's Rapid Spectral Detector. Getting you all the spectral data you need at one and the same time—chromatograms and spectra in just one run. With parameters set after the run, not before. And when you can automatically access spectra on the upslope, apex and downslope of even the fastest peak, you just can't miss it. However small or wherever it's hidden, the Rapid Spectral Detector finds every single peak, checks it for purity and gives you positive identification.

### The Diode Array Detector that gives you greater value

You probably never thought you could get so much value from a diode array that's so small. Use it with your own LC and any standard output device, and you've set up the most economic diode array detection system you'll find in any lab.

When you need more analytical power, just connect a personal computer. You'll be able to manipulate original data without reruns. Get more information, greater

detail and increased certainty. Want spectral overlay, normalized spectra or peak integration? Our software gives it to you. Plus color coded isograms that'll show you peaks where you never thought of looking, even when they're disguised by noise.



*As a stand-alone unit, the Rapid Spectral Detector offers four channels for wavelength bunching and ratios, time integrated spectra and spectral suppression. Alternatively, fully computerized analysis is obtainable by adding a PC.*

### The Diode Array Detector that creates your own private library

Store and retrieve spectra at the touch of a button. Get spectral search routines for automatic identification. Create thousands of entries. Add, replace and edit. Display, plot and print all data. Just call for a demonstration, attend one of our seminars or visit any one of our many customers. Get in touch with LKB. We'll give you all the facts.



LKB-Produkter AB, Box 305, S-161 26 Bromma, Sweden. Tel. +46(8)98 00 40, telex 10492  
 Antwerp (03) 218 93 35 · Athens-Middle East +30 (1) 894 73 96 · Copenhagen (01) 29 50 44 · Hongkong (852) 5-555555  
 London (01) 657 88 22 · Lucerne (041) 57 44 57 · Madras (044) 45 28 74 · Moscow (095) 255-6984 · Munich (089) 85 830  
 Paris (01) 64.46.36.36 · Rome (06) 3990 33 · Stockholm (08) 98 00 40 · Tokyo (03) 293-5141 · Turku (021) 678 111  
 Vienna +43 (222) 92 16 07 · Washington (301) 963 3200 · Zoetermeer (079) 31 92 01  
 Over 60 qualified representatives throughout the world.

Circle No. 132 on Readers' Service Card



## American Association for the Advancement of Science

*Science* serves its readers as a forum for the presentation and discussion of important issues related to the advancement of science, including the presentation of minority or conflicting points of view, rather than by publishing only material on which a consensus has been reached. Accordingly, all articles published in *Science*—including editorials, news and comment, and book reviews—are signed and reflect the individual views of the authors and not official points of view adopted by the AAAS or the institutions with which the authors are affiliated.

**Publisher:** William D. Carey

**Editor:** Daniel E. Koshland, Jr.

**Deputy Editors:** Philip H. Abelson (*Engineering and Applied Sciences*); John I. Brauman (*Physical Sciences*); Gardner Lindzey (*Social Sciences*)

## EDITORIAL STAFF

**Managing Editor:** Patricia A. Morgan

**Assistant Managing Editors:** Nancy J. Hartnagel, John E. Ringle

**Senior Editors:** Eleanor Butz, Lawrence I. Grossman, Ruth Kulstad

**Associate Editors:** Martha Collins, Sylvia Eberhart, William Greaves, Barbara Jasny, Katrina L. Kelner, Edith Meyers

**Letters Editor:** Christine Gilbert

**Book Reviews:** Katherine Livingston, *editor*; Linda Heiserman

**This Week in Science:** Ruth Levy Guyer

**Chief Production Editor:** Ellen E. Murphy

**Editing Department:** Lois Schmitt, *head*; Caitilin Gordon, Barbara E. Patterson

**Copy Desk:** Isabella Bouldin, *chief*; Mary McDaniel, Sharon Ryan, Beverly Shields

**Production Manager:** Karen Schools

**Graphics and Production:** John Baker, *assistant manager*; Holly Bishop, Kathleen Cosimano, Eleanor Warner

**Covers Editor:** Grayce Finger

**Manuscript Systems Analyst:** William Carter

## NEWS STAFF

**News Editor:** Barbara J. Culliton

**News and Comment:** Colin Norman, *deputy editor*; Mark H. Crawford, Constance Holden, Eliot Marshall, R. Jeffrey Smith, Marjorie Sun, John Walsh

**Research News:** Roger Lewin, *deputy editor*; Deborah M. Barnes, Richard A. Kerr, Gina Kolata, Jean L. Marx, Arthur L. Robinson, M. Mitchell Waldrop

**European Correspondent:** David Dickson

## BUSINESS STAFF

**Chief Business Officer:** William M. Miller, III

**Business Staff Supervisor:** Deborah Rivera-Wienhold

**Associate Business Supervisor:** Leo Lewis

**Membership Recruitment:** Gwendolyn Huddle

**Member and Subscription Records:** Ann Ragland

**Guide to Biotechnology Products and Instruments Editor:** Richard G. Sommer

## ADVERTISING REPRESENTATIVES

**Director:** Earl J. Scherago

**Production Manager:** Donna Rivera

**Advertising Sales Manager:** Richard L. Charles

**Marketing Manager:** Herbert L. Burkland

**Sales:** New York, NY 10036: J. Kevin Henebry, 1515 Broadway (212-730-1050); Scotch Plains, NJ 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); Chicago, IL 60611: Jack Ryan, Room 2107, 919 N. Michigan Ave. (312-337-4973); Beverly Hills, CA 90211: Winn Nance, 111 N. La Cienega Blvd. (213-657-2772); San Jose, CA 95112: Bob Brindley, 310 S. 16 St. (408-998-4690); Dorset, VT 05251: Fred W. Dieffenbach, Kent Hill Rd. (802-867-5581).

Instructions for contributors appears on page xi of the 28 March 1986 issue. Editorial correspondence, including requests for permission to reprint and reprint orders, should be sent to 1333 H Street, NW, Washington, DC 20005. Telephone: 202-326-6500.

Advertising correspondence should be sent to Tenth Floor, 1515 Broadway, NY 10036. Telephone 212-730-1050.

## Global Economic Competition

Most of us have been steeped in widespread faith in U.S. technological superiority. But we face disturbing evidence that we are doing poorly in global economic competition. Last year, our annual merchandise trade deficit was \$148 billion. The figures were proportionately worse for January 1986, when the deficit was \$16.5 billion. The United States is comparatively rich in natural resources of land and energy. Yet it competes poorly with countries less well endowed. For example, in 1985 we exported to Japan goods worth \$22.6 billion and imported \$72.4 billion. The corresponding figures for West Germany were \$9.0 billion and \$21.2 billion.

No single product line accounts for our worsening position. We have lost ground in competition in automobiles, steel, machine tools, pharmaceuticals, chemicals, consumer electronics, memory chips, nuclear energy, and satellite launching.

The decay in the U.S. position has been proceeding for more than a decade. Because of its important deleterious effects, including lost jobs, the situation has been examined by the National Academy of Engineering (NAE). In a series of studies beginning in 1982, the NAE has conducted investigations of the global competitive status of U.S. industry.\* As might be expected, the problems of no two industries were found to be exactly alike. However, some common features emerged. One is that despite the disparate nature of the various industries, all are of world scale. At one time, the United States was the major market, but today the total elsewhere is large and growing fast. If a company can compete in the larger global market, it can attain economies of scale in manufacturing and can spread research and development costs over a larger number of items. However, many U.S. companies, especially the smaller ones, have failed to tap the global market.

Another common theme arising from the NAE studies is the lack of coherence and mutual reinforcement among policies and institutions in the United States in contrast to the situation in Japan and to some extent in West Germany. In those countries, the report notes:

- Tax policy favors exports
- The educational system produces a large number of technical graduates—many trained for careers in manufacturing
- Capital markets foster a longer term viewpoint for evaluating investments and provide funds for exports
- Government officials at all levels recognize the vital role of exports and provide direct, visible (sometimes financial) support for them in negotiating sales and in aggressive negotiation of supportive international trade policies
- Industrial management develops product lines and formulates business strategies with world markets as the target

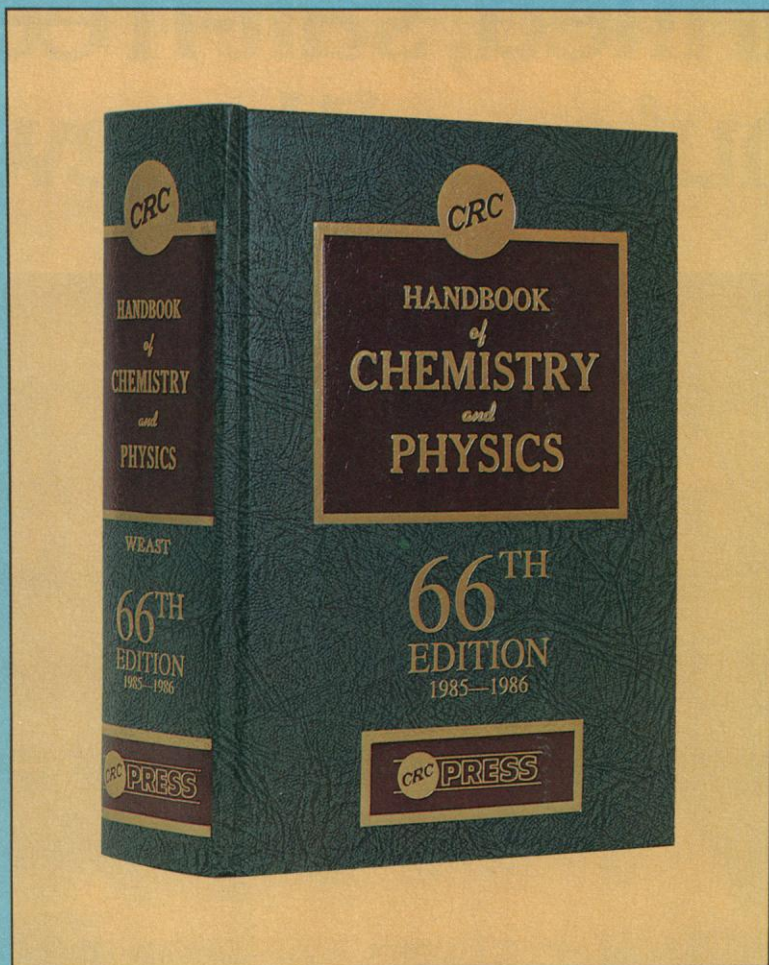
Some of these deficiencies could in principle be eliminated rather quickly. However, our failures in education cannot be remedied quickly and will handicap us for years to come. We have not educated as many engineers per capita as have Japan and Germany. Our vocational training effort is small in comparison with that of West Germany. There, 58 percent of the labor force has had 4 years of vocational training. The people thus trained are flexible in meeting new technological problems.

One handicap not mentioned in the report is the current public demand for a risk-free society. Such attitudes have increased costs of production in many industries, rendering them less competitive, and are likely to lead to our loss of leadership in biotechnology.

In view of the many factors contributing to our poor competitiveness, it should be clear that no single "quick fix" will suffice. Excellence in R&D, while necessary, is not sufficient. There are many weaknesses that must be addressed. In spite of these deficiencies, the members of the studies groups conclude on an optimistic note. They state that the problems identified are amenable to solution. We are not suffering some inexorable decline. We do not lack critical natural, human, or technological resources. However, a broad awareness of changing international circumstances will be required, as well as an informed understanding of the ingredients necessary for competition in international markets.—PHILIP H. ABELSON

\*L. W. Steele and N. B. Hannay, *The Competitive Status of U.S. Industry—An Overview* (National Academy Press, Washington, DC, 1985).





# SAVE 53%

The most recent edition of the *CRC Handbook of Chemistry and Physics* is being offered for a limited time only at less than half price — that's \$35.00 off the regular price of \$64.95.

Each year *The Handbook* is reviewed and revised by an international panel of authorities, placing it among the most complete and up-to-date references available to scientists worldwide.

You'll quickly find what you're looking for in this comprehensive resource of over 2300 pages of graphs, tables, formulas, and property information.

# NOW ONLY \$29.95

## ORDER FORM

Rush me the 66th Edition of the *CRC Handbook of Chemistry and Physics* for only \$29.95\* (regularly \$64.95).

To qualify for this special offer, each order should:

- be postmarked by May 15, 1986
- specify catalog no. 466KFM

Enclosed is my check/money order for \$\_\_\_\_\_

Name \_\_\_\_\_

Co./Inst. \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

- be prepaid by check, money order, or charged to one of the credit cards below

☐ American Express ☐ MasterCard ☐ Visa

Account # (include all digits)

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Expiration Date \_\_\_\_\_ Validation Date (AMEX) \_\_\_\_\_

Signature (required for credit card orders). Please use ink. \_\_\_\_\_

Please print name appearing on credit card. \_\_\_\_\_

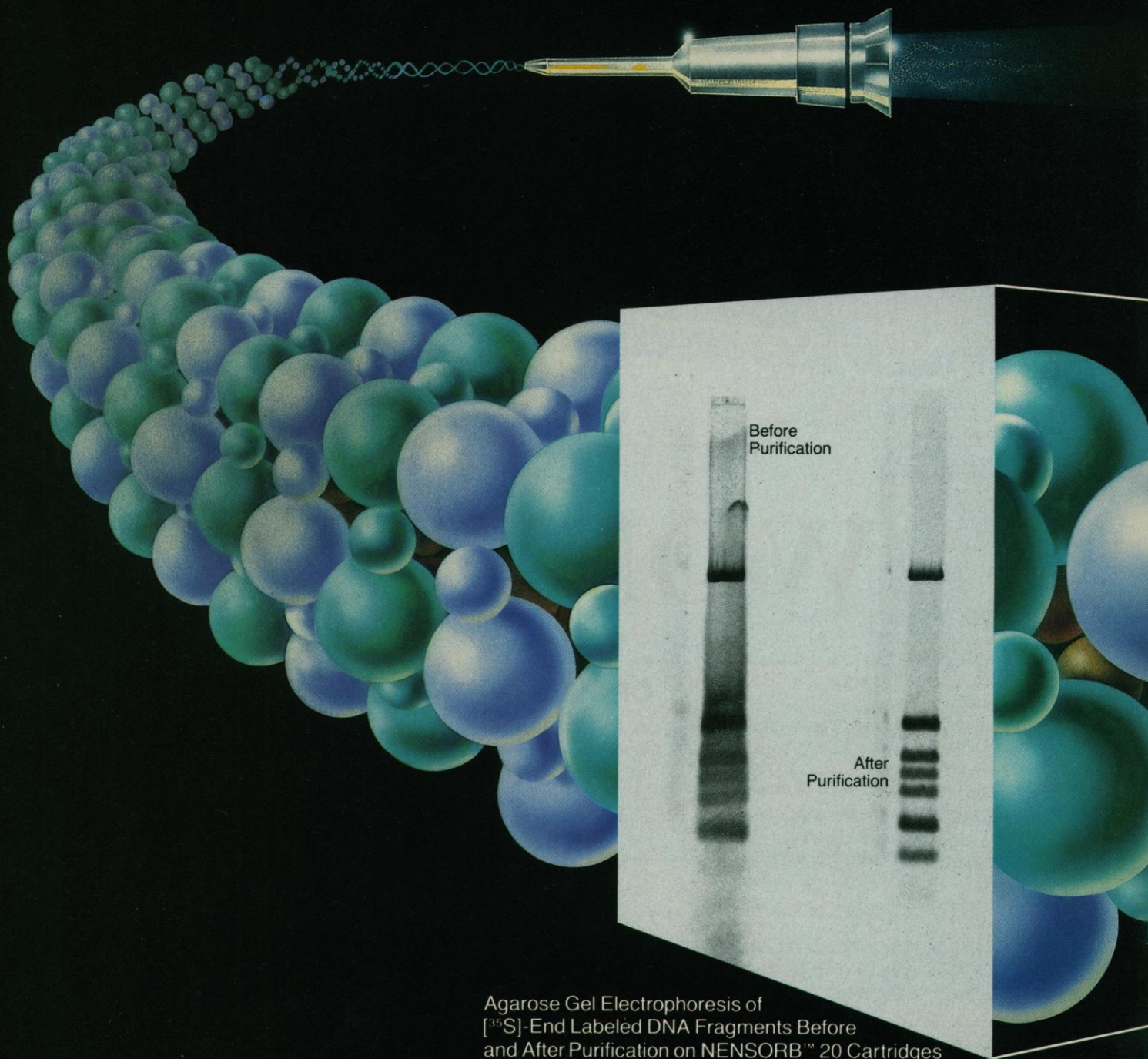
\*Outside U.S., \$34.95 per copy. Payable in U.S. currency or draft on a U.S. bank. Florida residents add 5% sales tax.

Order TOLL FREE 1-800-272-7737 • Monday-Friday • 8:30 a.m. to 5 p.m. (In Florida call collect: 1-305-994-0563.)

**CRC PRESS, INC.** 2000 Corporate Blvd., N.W. Boca Raton, Florida 33431



# Get purified, salt-free < 15 minutes with new





# DNA or RNA in NENSORB™ 20 cartridges

The new Du Pont NENSORB™ 20 nucleic acid purification cartridge purifies single or double-stranded nucleic acids in one simple step...without salt or ethanol precipitation.

NENSORB™ 20 is the first effective alternative to tedious nucleic acid purification methods. For example, samples with 1 ng to 20 µg of RNA or DNA are generally purified in less than 15 minutes. Conventional methods can take 30 to 60 minutes. With NENSORB™ 20, salts and unincorporated nucleotides pass through the cartridge; the proteins bind irreversibly to the cartridge bed; and the nucleic acid is eluted. It's that simple. You have salt-free, biologically-active samples.

NENSORB™ 20 cartridges offer exceptional reproducibility and recovery ranging from 60 to 90 percent. Reproducibility and recovery are ensured by extensive quality control on every lot of cartridges. This testing includes measuring sample recovery and biological activity of purified DNA, and testing that restriction enzyme is separated from plasmid DNA. The convenient, disposable NENSORB™ 20 cartridge can be used with syringe, vacuum box or automated processor.

**Call 1-800-992-0412, ext. 4003.**

For more technical information on NENSORB™ 20, call, or write Du Pont Company, Biotechnology Systems, Leadtrack Room 20, 595 Colonial Park Drive, Roswell, GA 30075.

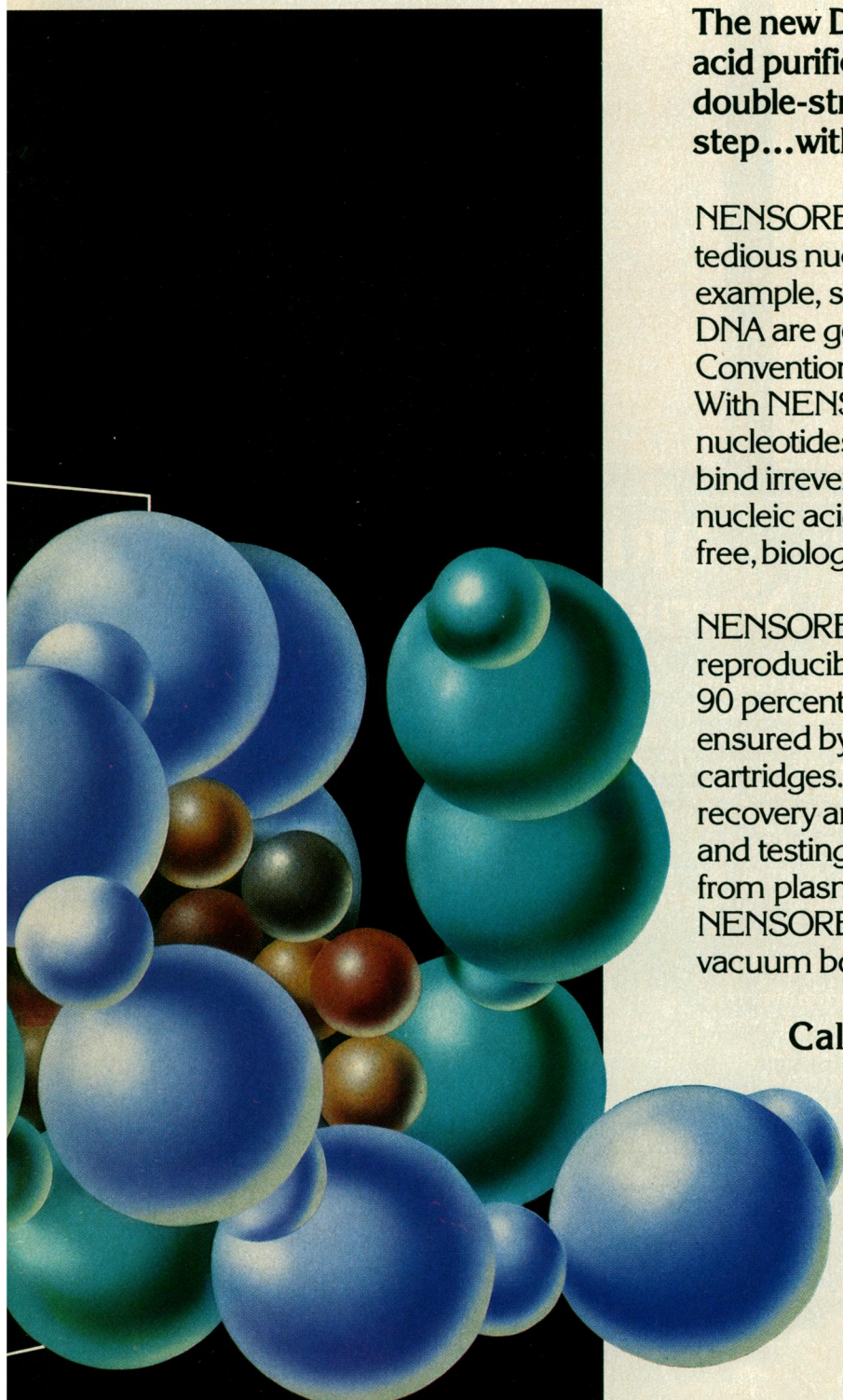
Circle No. 83 on Readers' Service Card

**NEN Research Products  
Biotechnology Systems**



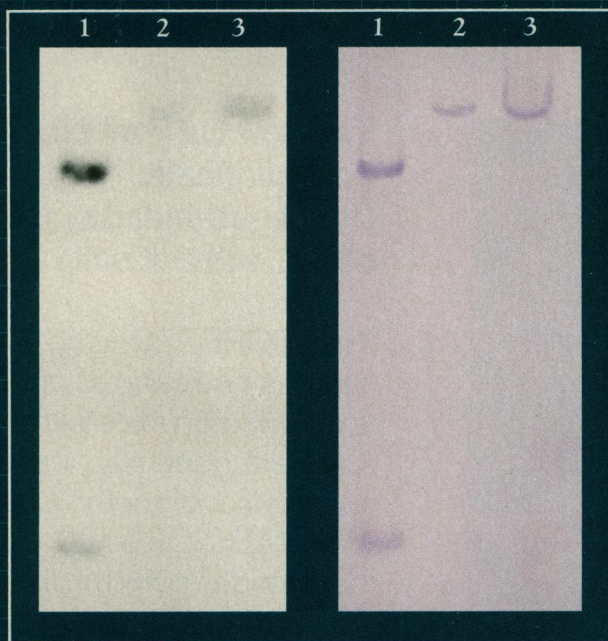
REG. U.S. PAT. & TM. OFF.

Visit Dupont at Booth #s 1001-1009 and 1062-1070 at ASM





# There Are Two Methods That Achieve Detection of $< 1$ pg DNA



## BRL's is Nonradioactive

For years you used autoradiography because it was the only method providing reliable sensitivity. Now you can detect single-copy genes without the risk, expense and complications of radioactive labeling. With BRL BluGENE™, you can detect DNA consistently at levels as low as 0.25 pg.

### Better than autoradiography

**Stable probe:** BRL BluGENE™ detects a biotin-labeled probe that remains stable—and usable—for at least 1 year. Radioactive probes decay within a few days.

**Faster results:** With BluGENE™ you can detect single-copy genes in less than 1 hour, and full color development is complete in just 3 hours. Autoradiography could keep you waiting overnight.

### New conjugate improves sensitivity

The new streptavidin-alkaline phosphatase conjugate developed at BRL achieves

greater sensitivity than previous nonradioactive methods. The high ratio of active enzyme to active streptavidin allows better visualization of low levels of DNA. Hybridization studies at BRL using pBR322 containing the 1.1-Kb Mst II fragment of the human  $\beta$ -globin gene have shown that BluGENE™ routinely detects 0.25 pg of insert DNA from 1.25 pg of EcoR I-digested plasmid.

### See for yourself

BRL's expertise in nonradioactive detection has resulted in a kit that's both sensitive and easy to use. BluGENE™ detects DNA on nylon or nitrocellulose filters, without expensive equipment or complicated procedures. Ask for the BluGENE™ protocol and brochure to see for yourself.

For research use only.

*After 3 hours a single-copy human  $\beta$ -globin gene was detected using autoradiography with an intensifying screen (left) and BluGENE™ (right).*

*Samples of a plasmid containing the 1.1-Kb Mst II fragment of the human  $\beta$ -globin gene in the EcoR I site of pBR322 (Chang, J. C. and Kan, Y. W. (1982) N. Engl. J. Med., 307, 30) were labeled by nick translation with [ $\alpha$ - $^{32}$ P]dATP ( $1.5 \times 10^8$  dpm/ $\mu$ g DNA) (left) or biotin-11-dUTP (right) and hybridized to Southern blots for 18 hours under identical conditions. Lane 1 contains sheared herring sperm DNA (1  $\mu$ g) and EcoR I-digested plasmid (5 pg DNA: 4 pg vector in the upper band and 1 pg insert in the lower band). Lanes 2 and 3 contain 2  $\mu$ g and 10  $\mu$ g, respectively, of EcoR I-digested human genomic DNA.*

**BRL**

Bethesda Research Laboratories  
Life Technologies, Inc.  
P.O. Box 6009  
Gaithersburg, Maryland 20877 U.S.A.  
Telex: 64210 BRL GARG UW  
To Order: (800) 638-8992  
Tech-Line™: (800) 638-4045  
In Maryland and outside the U.S.:  
(301) 840-8000

GIBCO/BRL  
Life Technologies, Inc.  
2260A Industrial Street  
Burlington, Ontario  
Canada L7P 1A1  
To Order/Tech-Line™: (416) 335-2255

Circle No. 153 on Readers' Service Card



# Did you say "QVECs"?

"Have you heard about QVECs?"

"Q-Vecks? That's the new mathematical theory developed by that fellow from Cambridge."

"Kuvecks? Of course. Those small Russian game birds."

"Cuevecks? You mean those things you use to polish the ends of cue sticks?"

"Que-vecques? Oh, sure. They're little French pastries oozing with whipped cream."

"Cuvecs? I think it has something to do with wine."



Try it yourself. Take any half-dozen well-informed staff members and say knowingly, "Of course, you've heard about these new QVECs." You'll be treated to at least five different versions of precisely what QVECs are *not*.

What no one will admit to—especially at the Dean's annual reception—is that they have no idea whether QVECs are a cream-filled French pastry or the focus of the latest microchip research.

A pity. Because for many of your people, TIAA-CREF's QVECs (short for *Qualified Voluntary Employee Contributions*) represent an intelligent, convenient and highly competitive *tax-deferred* alternative to an IRA.

In fact, if any members of your staff are considering buying IRAs, your institution should be offering them TIAA-CREF QVECs—for these important reasons.

- ☐ QVECs provide a lifetime income, unlike most IRAs.
- ☐ QVECs currently offer attractive rates of return.
- ☐ QVECs offer the investment choice between two funds—TIAA and CREF.
- ☐ QVECs are portable—when staff move to another institution that offers QVECs, their QVECs can go right along.

So sooner or later you can expect to be interrogated on the subject of QVECs by the head of business studies or the rising star of the history department. And you'll want to have the facts at your command.

We can provide them. For a full briefing, simply return the form below or write us at QVECs, TIAA-CREF, 730 Third Avenue, New York, New York 10017. Then, when the subject comes up, as it's sure to do, you'll be ready to set the record straight.

## QVECs. The educated alternative to an IRA.



Teachers Insurance and Annuity Association  
College Retirement Equities Fund  
730 Third Avenue  
New York, New York 10017

SCI 3-28-86

**Y**es. Please send me *free* all I need to become an instant expert on QVECs, so I can pass the word on to my staff members.

Name \_\_\_\_\_

Title \_\_\_\_\_

Institution \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

Zip \_\_\_\_\_



**Physicians**  
**American Society for Clinical Investigation**  
**American Federation for Clinical Research**  
**1986 NATIONAL SCIENTIFIC MEETINGS**  
**MAY 2-5, 1986 • WASHINGTON, D.C.**

**FEATURED RESEARCH SYMPOSIA:**

Atrial Natriuretic Factor  
Acquired Immunodeficiency Syndrome  
Drug Resistance in Tumor Biology  
Molecular Biology of the Heart  
Signal Transduction in the GI Tract  
Thrombolytic Therapy in Cardiovascular Disease

**FEATURED LECTURERS:**

John Baxter, MD  
Eugene Braunwald, MD  
Joseph Goldstein, MD  
Michael Berridge, PhD  
Jean Wilson, MD  
Arthur Rubenstein, MD  
George Cahill, MD  
Purnell Choppin, MD  
Jay Sanford, MD  
Michael Bishop, MD  
Thomas Waldmann, MD

**FEATURED STATE-OF-THE-ART PRESENTATIONS:**

Tumor Necrosis Factor (Cachectin)  
Genetic Aspects of Cardiac Contraction  
Tissue Plasminogen Activating Factor  
Thymic Microenvironment and T-Cell Maturation  
Prions and Degenerative Neurologic Disease  
Angiogenesis and Angiogenesis Factor  
Myocardial Infarction: Reperfusion and Injury  
Human Oncogenes  
Inositol Trisphosphate and Signal Transduction

**FEATURED ORIGINAL RESEARCH PRESENTATIONS:**

Adrenergic Receptor Kinase  
Parathyroid Growth Factor  
Hepatocyte—Liver Transplantation  
Platelet Derived Growth Factor Receptor Structure  
Atrial Natriuretic Factor Receptor Purification  
Transactivation of the HTLV-III Virus  
Genetic Variation of the HTLV-III Virus

**FOR REGISTRATION INFORMATION CONTACT:** AAP/ASCI/AFCR Registration Supervisor, SLACK Incorporated,  
6900 Grove Road, Thorofare, NJ 08086-9433  
(Telephone number: 609-848-1000)

**NEW AAAS PUBLICATION**

# Scientists and Human Rights

**Present and Future Directions**

*Proceedings from a 1984 AAAS Annual Meeting Workshop*

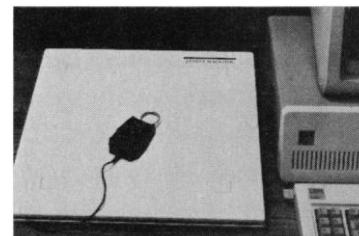
The second workshop report of the AAAS Clearinghouse on Science and Human Rights, a project of the AAAS Committee on Scientific Freedom and Responsibility, examines the activities of scientific societies in the human rights field. Workshop speakers also review mechanisms available within international inter-governmental organizations to address human rights violations of scientific and medical professionals.

Prepared by Kathie McCleskey, Senior Program Associate, AAAS Clearinghouse on Science and Human Rights.

\$3.00, paperbound, 70 pp.

Order from AAAS Sales Department, 1333 H St., NW, Washington, DC 20005. Please add \$1.50 postage and handling per order. Make checks payable to AAAS.

## **AUTOMATE <sup>NEW</sup> MEASUREMENT ON YOUR IBM PC**



**New digitizing tablet with  
Sigma-Scan™ measurement  
software. \$1195**

**Cat #3011 — 12" x 12" system**

Resolution of .025 mm, accuracy of at least .25 mm. Comes with state-of-the-art software for area, linear, perimeter, length of curvy line, and angular measurements. X, Y point or stream digitizing. Descriptive statistics. Transfer data to other programs in standard ASCII or DIF format.

This and other new Microcomputer Tools for the Scientist. Call or write today for FREE catalog.

**JANDEL SCIENTIFIC**

2656 Bridgeway, Sausalito, CA 94965  
800-874-1888

(In Calif. call 415-331-3022)

Circle No. 14 on Readers' Service Card

# Information for Contributors

## THE EDITORS OF *SCIENCE*

Manuscripts should be addressed to the Editor, *Science*, 1333 H Street, NW, Washington, DC 20005. Submit three copies together with a letter of transmittal giving

- 1) the names and telephone numbers of the authors;
- 2) the title of the paper and a statement of its main point;
- 3) three to eight keywords to be used for indexing;
- 4) the names, addresses, telephone numbers, and fields of interest of four to six persons outside your institution who are qualified to referee the paper;
- 5) the names of colleagues who have reviewed the paper;
- 6) the total number of words (including text, references, and figure and table legends) in the manuscript; and
- 7) a statement that the material has not been published and is not under consideration for publication elsewhere.

In addition, include with your manuscript (i) any paper of yours that is in press or under consideration elsewhere and includes information that would be helpful in evaluating the work submitted to *Science*; (ii) written permission from any author whose work is cited as a personal communication, unpublished work, or work in press but is not an author of your manuscript; and (iii) for review of manuscripts based on crystallographic data, two copies of the coordinates. (It is expected that, if the manuscript is accepted, coordinates will be offered for deposit to the appropriate crystallographic data bank.)

Before being reviewed in depth, most papers are rated for their interest and overall suitability by a member of the Board of Reviewing Editors. When papers are submitted in disciplines for which there is no appropriate member of the Board of Reviewing Editors, the initial screening is done by editorial staff members in consultation with outside experts in those areas. Papers that are not in the highest rating category are returned to the authors within about 2 weeks; the title page and abstract from one copy are retained for our files. The others are reviewed in depth by two or more

outside referees. Authors are then notified of acceptance, rejection, or need for revision within 6 to 10 weeks from the date of receipt. As stated in the editorial of 18 January 1985 (*Science*, volume 227, page 249), there can be no resubmissions, either of papers returned after initial screening or of papers returned after in-depth review.

## Conditions of Acceptance

When a paper is accepted for publication in *Science*, it is understood by the editors (i) that any materials necessary to verify the conclusions of the experiments reported will be made available to other investigators under appropriate conditions; (ii) that all authors have seen and approved the final version of the manuscript; and (iii) that a paper accepted by *Science* will not be released to the press or the public before its publication. If there is a need in exceptional cases to publicize research findings in advance of publication, the AAAS Office of Communications (202-326-6440) must be consulted.

## Selection of Manuscripts

In selecting papers for publication, the editors give preference to those of general significance that are well written, well organized, and intelligible to scientists in different disciplines. An attempt is made to balance the subject matter in all sections of *Science*. Membership in the AAAS is not a factor in selection.

Papers accepted for publication are edited to improve the accuracy and effectiveness of communication and to bring them within the specified length limits. When the author's meaning is not clear, the editor may consult the author by telephone; when editing is extensive, the manuscript may be returned to the author for approval and retyping before the type is set.

Six categories of signed papers are published: general articles, research articles, reports, letters, technical comments, and book reviews.

**General Articles.** General articles (up to 5000 words) are expected to (i) review new developments in one field that will be of interest to readers in other fields; (ii) describe a current research problem or a technique of interdisciplinary significance; or (iii) discuss some aspect of the history, logic, philosophy, or administration of science and public affairs. Readers should be able to learn from a general article what has been firmly established and what are unresolved questions; speculation should be kept to a minimum.

Many of the general articles are solicited by the editor. Both solicited and unsolicited articles undergo review.

General articles should include a note giving the authors' names, titles, and addresses; a summary (50 to 100 words); an introduction that outlines for the general reader the main point of the article; and brief subheadings to indicate the main ideas. The reference list should not be exhaustive; a maximum of 40 references is suggested. Figures and tables should occupy no more than one printed page.

**Research Articles.** A research article (up to 4000 words) is expected to contain new data representing a major breakthrough in its field. The article should include an author note, abstract, introduction, and sections with brief sideheads. There should be a short introduction outlining for the general reader the main point of the paper, a description of the experiments and the results, and then a discussion or conclusion. A maximum of 30 references is suggested. Figures and tables together should occupy no more than one printed page.

**Reports.** Reports are expected to contain important research results or reliable theoretical calculations whose essence can be expressed briefly. Preference is given to reports of discoveries that will be of broad interdisciplinary interest or of unusual interest to the individual discipline. Reports should include an abstract (no more than 100 words) and an introductory paragraph. The total number of words, including the references and notes and figure and table legends, should not exceed 2000. A maximum of 20 references is suggested. Figures and tables together should occupy no more than half a printed page.

**Letters.** Letters are selected for their pertinence to material published in *Science* or because they discuss problems of general interest to scientists. Letters pertaining to material published in *Science* may correct errors; provide support or agreement; or offer different points of view, clarifications, or additional information. Personal remarks about another author are inappropriate. Letters may be reviewed by outside consul-



tants. Letters selected for publication are intended to reflect the range of opinions received. The author of the *Science* paper in question is usually given an opportunity to reply.

All letters are acknowledged by postcard; authors are duly notified as to whether their letters are to be published. Preference is given to letters that do not exceed 250 words. Letters accepted for publication are frequently edited and shortened in consultation with the author.

**Technical Comments.** Technical comments (up to 500 words) may criticize articles or reports published in *Science* within the previous 6 months or may offer useful additional information. Discussions of minor issues or priority claims are not appropriate, nor are questions that can be resolved by private correspondence. The authors of the original paper are usually asked for an opinion of the comments and are given an opportunity to reply in the same issue if the comments are accepted. The comments, and sometimes the reply, are subject to the usual review procedures.

**Book Reviews.** The selection of books to be reviewed and of reviewers is made by the editors. Instructions and length specifications accompany the books when they are sent to reviewers.

## Manuscript Preparation

**Typing.** Use double-spacing throughout the text, tables, figure legends, and references and notes and leave margins of at least 2.5 centimeters. Put your name on each page and number the pages starting with the title page.

**Titles.** Titles should be short, specific, and amenable to indexing. For general articles the maximum length is 52 characters and spaces; for research articles and reports the maximum is 108 characters.

**Summaries or abstracts.** These should include a sentence or two explaining to the general reader why the research was undertaken and why the results should be viewed as important. The abstract should convey the main point of the paper and outline the results or conclusions. Use of the first person, singular or plural, should be avoided.

**Text.** A brief introduction should portray the broad significance of the paper. The

whole text should be intelligible to readers in different disciplines. Technical terms should be defined. All tables and figures should be cited in the text in numerical order.

**Units of measure.** Use metric units. If measurements were made in English units, give metric equivalents.

**Symbols and abbreviations.** Define all symbols, abbreviations, and acronyms.

**References and notes.** Number references and notes in the order in which they are cited, first through the text and then through the table and figure legends. Use conventional abbreviations for well-known journals; provide complete titles for other journals. For references with up to five authors provide all the names; for more than five, provide the name of the first author only. Some examples follow:

1. A. B. Brown, C. K. Black, M. Matthews, R. Strong, I. Ebbitt, *Proc. Natl. Acad. Sci. U.S.A.* 72, 512 (1970).
2. P. Curtis *et al.*, in *Clinical Neurology of Development*, B. Walters, Ed. (Oxford Univ. Press, New York, 1983), pp. 60-73.
3. S. E. Wisdom, *Multicomponent Models of Ancient Skies* (NIE 79-1 Technical Report, University of Kansas, Lawrence, 1979).
4. B. Quick, *Man's Environment* (Macmillan, New York, 1932).
5. A. Able and P. Stark, *Geol. Soc. Am. Abstr. Programs* (1981), p. 215.
6. J. English, thesis, State University of New York, Stony Brook (1980).

**Acknowledgments.** Gather all acknowledgments into a brief statement at the end of the references and notes.

**Informed consent.** Investigations on human subjects must include a statement indicating that informed consent was obtained after the nature and possible consequences of the studies had been fully explained.

**Figures.** For each figure submit three high-quality glossy prints or original drawings of sufficient size to permit relettering but not larger than 22 by 28 centimeters (8½ by 11 inches). On the back of every figure write the first author's name and the figure number and indicate the correct orientation. *Manuscripts with oversized figures will be returned to the author without review.* Photocopies of figures are not acceptable; transparencies, slides, or negatives cannot be used since they cannot be sent to reviewers.

On acceptance of a paper, authors requesting the use of color will be asked to

supply slides or negatives of the color artwork and to pay \$600 for the first color figure and \$300 for each additional figure as a contribution toward printing costs.

Illustrations reprinted from other publications must be credited. It is the author's responsibility to obtain permission to reprint such illustrations in *Science*.

**Tables.** Tables should supplement, not duplicate, the text. They should be numbered consecutively with respect to their citation in the text. Each table should be typed, with its legend (double-spaced), on a separate sheet. Give each column a heading with units of measure indicated in parentheses. Do not change the unit of measure within a column.

**Equations and formulas.** Use quadruple-spacing around equations and formulas that are to be set off from the text. Define all symbols.

**Statistical presentations.** Report the uncertainty associated with results, including the specific measure of uncertainty used and the sources of error in it. Probabilities from statistical tests of significance should be subordinated to the reporting of results and associated uncertainties. Limitations to the generalizability of the results should be explicitly stated.

## Printing and Publication

**Proofs and reprints.** One set of galley proofs is sent to the authors. An order blank for reprints accompanies the proofs.

**Scheduling.** Papers are scheduled for publication after *Science* has received corrected galley proofs from the authors. There may be delays for papers with tables or figures that present problems in layout, for papers with color figures, for papers accompanied by cover pictures, and for papers that exceed the length limits.

## Cover Photographs

Particularly good photographs that pertain to a paper being submitted will be considered for use on the cover. Submit prints (not slides, negatives, or transparencies) with the manuscript and indicate in the letter of transmittal that a possible cover picture is enclosed.



# Tours

Sunday, 25 May, through  
Friday, 30 May

**T**HE PHILADELPHIA ADVISORY COMMITTEE TO THE AAAS Annual Meeting is pleased to offer 15 tours organized especially for registrants. These tours are only a sampling of the many scientific and cultural institutions located in and around the City of Brotherly Love. We at AAAS are delighted to join our Philadelphia hosts in inviting you to visit as many of these exciting sights and places as possible.

**1. Philadelphia Museum of Art.** Sunday, 25 May, 11:45 am–2:15 pm (Limit: 48 persons)

The Philadelphia Museum of Art, America's third largest museum, with 10 acres of gallery space, is itself the finest example of Greco-Roman architecture in the country. The tour will concentrate on "Science and the Arts." The mutual concern of artists and scientists for understanding man and nature has often led them in similar directions in efforts to unravel the mysteries of life. This tour of the museum's collections will draw upon images created by artists over several centuries, ranging from Peter Paul Rubens to Thomas Eakins and Constantin Brancusi. After the guided tour, you will have one hour to explore the rest of the museum before returning to the hotel.

**2. Fairmount Park Mansions.** Sunday, 25 May, 1:00 pm–4:00 pm (Limit: 48 persons)

Bus tour down the Benjamin Franklin Parkway—the Champs Elysees of Philadelphia—passing Logan Circle, the Franklin Institute, and the Academy of Natural Sciences. Then on to Fairmount Park, the world's largest municipal park, which contains many sculptures including Remington's "The Cowboy." You will then take a private tour of two of the restored Fairmount Park Mansions, returning via Kelly Drive, home of historic Boathouse Row.

**3. Morris Arboretum of the University of Pennsylvania.** Monday, 26 May, 1:00 pm–4:00 pm (Limit: 40 persons)

Located on the northwestern edge of Philadelphia, the Morris Arboretum comprises 175 acres of landscaped grounds, botanical laboratories, and a one-of-a-kind Victorian fernery. The visit, hosted by Arboretum director Dr. William M. Klein, will include highlights of a collection noted for its many mature specimens of Asian trees in a Victorian garden setting. Rhododendron bloom should be at its peak, together with native magnolias, American yellowwood, white fringe tree, and Chinese dogwood. Research programs, including ongoing work on the flora of Pennsylvania, will be described by staff members of the Willaman Botanical Laboratories.

**4. Walking Tour of Historic Philadelphia.** Monday, 26 May, 1:00 pm–4:00 pm (Limit: 96 persons)

Step back 200 years with knowledgeable guides for a delightful look at our past: Touch the Liberty Bell, see Independence Hall, Congress Hall, and State House Yard. Go past the Second Bank along cobblestoned Library Walk to Dolley Todd's House, an 18th-century garden, Carpenters' Hall, a "barrow" street, Franklin's

Court, and picturesque Society Hill with its restored homes, "busybodies," 18th-century carriage steps, gardens, hidden walkways, and more.

**5. University of Delaware (Newark).** Tuesday, 27 May, 8:00 am–4:30 pm (Limit: 40 persons)

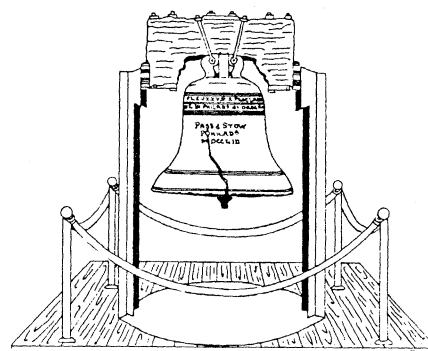
After a coffee reception, the tour starts with the Center of Catalytic Science and Technology, a research center specializing in single crystal surfaces, well-defined supported metals, supported metal and metal-oxide clusters, catalytic hydroprocessing, and spectroscopic methods for catalyst characterization. Next is the Center for Composite Materials, a national engineering research center for composite manufacturing science and engineering. After a complimentary lunch, the tour continues at the Institute of Energy Conversion, one of the world's largest thin-film solar-cell R&D laboratories.

**6. The Franklin Institute Science Museum.** Tuesday, 27 May, 1:00 pm–5:00 pm (Limit: 100 persons)

The Franklin Institute Science Museum explores a variety of topics including mechanics, aviation, shipbuilding, astronomy, earth sciences, optics, and mathematics. It includes the Fels Planetarium, a computerized state-of-the-art facility. This tour, conducted by Daniel L. Goldwater, Director of Exhibits and Chief Scientist, will focus on the museum's newest permanent exhibit: "Electricity and Electronics," which integrates historic artifacts and reconstructions with new technologies, such as a music synthesizer and a robot-controlled videocamera. Meet your tour guides at the 17th Street entrance of the Franklin Plaza Hotel for the walk around Logan Circle to the Franklin Institute.

**7. University of Pennsylvania.** Tuesday, 27 May, 2:00 pm–5:00 pm (Limit: 20 persons)

The University of Pennsylvania's data network and information services provide residence halls and campus, Philadelphia homes, and local area networks with services ranging from library catalog and literature search through departmental microcomputer labs to national networks and scientific computing facilities. The presentation will cover the architecture costs, progress, and the considerations that went into decisions in these areas.



- 8. E. I. du Pont de Nemours & Co.** (Wilmington, Delaware).  
Wednesday, 28 May, 9:00 am–2:30 pm (Limit: 48 persons)

The tour of the du Pont Company's Experimental Station will include demonstrations and exhibits selected from current work in polymers, molecular biology, medical diagnostics, chemical synthesis, electronic materials, computer science, and engineering. This site is the company's main research location; cameras are not permitted. Complimentary lunch provided by du Pont.

- 9. Rohm & Haas Company** (Spring House, Pennsylvania).  
Wednesday, 28 May, 9:30 am–2:30 pm (Limit: 36 persons)

The Rohm & Haas complex encompasses 10 modern buildings on a 140-acre site 20 miles north of Philadelphia. Demonstrations include the modern engine test facility, sophisticated capabilities for detecting and analyzing trace quantities of chemicals in terms of parts per trillion, and research in agricultural and coatings resins. Complimentary lunch provided by Rohm & Haas. **Note:** For this tour, registrants must submit in advance the name, address, and citizenship of each person for whom a ticket is purchased. Proof of identity is required on entering the facility; foreign nationals must show passports. Cameras are not permitted.

- 10. Fox Chase Cancer Center.** Wednesday, 28 May, 1:00 pm–4:45 pm (Limit: 20 persons)

The Fox Chase Cancer Center, located on a 47-acre campus in Northeast Philadelphia, was formed in 1974 from the union of the American Oncologic Hospital and The Institute for Cancer Research. You will visit the research, administrative, and patient care facilities, including the Center's new nuclear magnetic resonance facility which houses the most powerful magnet commercially available.

- 11. Smith Kline & French Laboratories** (Upper Merion, Pennsylvania). Thursday, 29 May, 8:30 am–12:30 pm (Limit: 96 persons)

Smith Kline & French Laboratories, the pharmaceutical division of SmithKline Beckman Corporation, will conduct tours of its new

R&D facilities. Come meet outstanding men and women in science and learn about SK&F's programs, which are targeted at major therapeutic areas in gastroenterology, immunology, and cardiovascular, respiratory, anti-infectives, and anticancer research. A complimentary lunch will be provided. Cameras are not permitted.

- 12. The Wistar Institute.** Thursday, 29 May, 2:00 pm–4:00 pm (Limit: 48 persons)

The oldest independent biomedical research organization in the nation, the Institute is famous for its contributions in aging, cancer, rabies, multiple sclerosis, and the relationship between diet and degenerative diseases. The theme of the program is "Fundamental Research in Cell and Molecular Biology." After welcoming remarks, the visitors will tour laboratories staffed by Institute scientists. Complimentary refreshments will be served.

- 13. Candlelight Stroll.** Thursday, 29 May, 7:30 pm–9:00 pm (Limit: 48 persons)

Relive Colonial days in picturesque Society Hill in the historic area of Philadelphia. Costumed guides recreate the customs and lifestyles of this old neighborhood of restored townhouses, 18th-century carriage steps, hidden walkways and courtyards, private gardens, historic churches, and more. You may return to the hotel in your bus at 9:00 pm or stay to enjoy the Headhouse Square activities and return on your own.

- 14. DNA Plant Technology Corporation** (Cinnaminson, New Jersey). Friday, 30 May, 8:30 am–11:30 am (Limit: 30 persons)

A slide presentation describing biotechnology research will be followed by a tour of the research facility. The tour, featuring numerous laboratories and an extensive greenhouse complex including a state-of-the-art tropical greenhouse, will be of special significance to those interested in plant genetics and tissue culture. Cameras are not permitted.



City center skyline as seen from the Benjamin Franklin Parkway, which extends from the banks of the Schuylkill River to City Hall.



15. **Philadelphia Electric Company.** Friday, 30 May, 1:45 pm–4:15 pm (Limit: 48 persons)

The Philadelphia Electric System Control Center is the operating center for PECO's high-voltage transmission and generation network. A computer system known as SAMAC (system automatic monitor and control) provides information display and analysis

needed by the system operators. Two large Burroughs computers scan 42 remote terminals located throughout the P.E. system to obtain real-time system data. Live data is displayed on 37 color CRT monitors and is available to system analysis programs, the results of which are used to make the minute-to-minute operating decisions required for a large metropolitan utility. The SAMAC system is one of the outstanding engineering achievements of its time.

## Tour Tickets Order Form

### AAAS Annual Meeting ♦ Philadelphia ♦ 25–30 May 1986

Mail to: AAAS Meetings Office, Dept. R, 1333 H Street, NW, Washington, DC 20005

Name \_\_\_\_\_ Tel. No.: (\_\_\_\_) \_\_\_\_\_

Institution or Company \_\_\_\_\_  
(If part of mailing address)

Street Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_

For Tour 9 indicate citizenship: \_\_\_\_\_

Indicate any special requirements due to a handicap: \_\_\_\_\_

Tour No.		Ticket Price	No. of Tickets
1.	Philadelphia Museum of Art (5/25) ...	\$ 6.00	_____
*2.	Fairmount Park Mansions (5/25) ...	15.00	_____
*3.	Morris Arboretum (5/26) .....	7.00	_____
*4.	Walking Tour (5/26) .....	12.00	_____
5.	Univ. of Delaware (5/27) .....	9.00	_____
6.	Franklin Inst. Museum (5/27) .....	Free	_____
7.	Univ. of Pennsylvania (5/27) .....	7.00	_____
8.	E. I. du Pont de Nemours & Co. (5/28)	7.00	_____
9.	Rohm & Haas Co. (5/28) .....	7.00	_____
10.	Fox Chase Cancer Center (5/28) ...	7.00	_____
11.	Smith Kline & French Labs. (5/29) .	6.00	_____
12.	The Wistar Institute (5/29) .....	6.00	_____
*13.	Candlelight Stroll (5/29) .....	10.00	_____
14.	DNA Plant Technol. Corp. (5/30) ...	9.00	_____
15.	Philadelphia Electric Co. (5/30) ....	6.00	_____

Total amount enclosed or charged \$ \_\_\_\_\_

Total number of tickets ordered \_\_\_\_\_

Tours are limited to Annual Meeting registrants only. All tours depart from and return to the 17th Street entrance of the Franklin Plaza Hotel at the times indicated. Comfortable walking attire is recommended.

Tour prices include transportation costs and any admission fees. Tickets will be mailed to you in early May. Orders received **after 9 May** will be held at the AAAS Ticket Desk at the Franklin Plaza Hotel. *Please order tickets for Sunday tours early enough so that they can be mailed to you.* Refund requests must be made by letter or telegram to the AAAS Meetings Office **before 16 May** and will be honored after the Meeting. No refunds will be made on cancellations received after this date.

Handicapped registrants who need advance tour information or assistance should so indicate on the order form, or contact *Virginia Stern, AAAS Project on the Handicapped in Science, 1333 H Street, NW, Washington, DC 20005 (telephone: 202-326-6667).*

\*Please note that Tours 2, 3, 4, and 13 are not fully accessible to mobility-impaired persons.

My check is enclosed. ☐

Charge to my ☐ VISA or ☐ MASTERCARD.

Account No. \_\_\_\_\_ Expiration Date \_\_\_\_\_

Cardholder's Name \_\_\_\_\_ Signature \_\_\_\_\_

## Advance Registration Form

### AAAS Annual Meeting ♦ Philadelphia ♦ 25–30 May 1986

Mail to: AAAS Meetings Office, Dept. R, 1333 H Street, NW, Washington, DC 20005

Please type or print clearly

Name of registrant \_\_\_\_\_  
(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 meeting: ☐ Sun ☐ Mon ☐ Tue ☐ Wed ☐ Thu ☐ Fri

☐ Check here if you need special services due to a handicap; we will contact you before the meeting.

Name(s) of new member(s): \_\_\_\_\_

■ Your registration badge, receipt, and voucher for full Program and Abstracts will be mailed to you in mid-April. ■ Registrations received after 9 May will be held at the Advance Registrants' Desk at the Franklin Plaza Hotel. ■ Refund requests must be made by letter or telegram to the above address before 16 May 1986 and will be honored after the Meeting. No refunds are made on cancellations received after this date. ■ Student registration fees apply to full-time undergraduate or graduate students only.

#### Advance Registration Fees:

Member (\$50) ..... \$ \_\_\_\_\_  
Nonmember (\$65) ..... \$ \_\_\_\_\_  
Student or retired (\$25) ..... \$ \_\_\_\_\_  
High school teacher (\$25) ..... \$ \_\_\_\_\_  
Spouse (\$25) ..... \$ \_\_\_\_\_

#### Join AAAS—register as a member:

(Add dues to member registration fee above)

\*Single membership dues (\$65) .. \$ \_\_\_\_\_  
\*Double [member & spouse] (\$82) .. \$ \_\_\_\_\_  
\*Single student or retired (\$40) .. \$ \_\_\_\_\_  
\*Double student or retired (\$57) .. \$ \_\_\_\_\_

Retired or spouse membership  
without *Science* (\$17) ..... \$ \_\_\_\_\_

**TOTAL AMOUNT** \$ \_\_\_\_\_

☐ Check enclosed

Charge my ☐ VISA ☐ MASTERCARD

Card number \_\_\_\_\_ Expires \_\_\_\_\_

Signature \_\_\_\_\_

\*Membership includes 51 issues of *Science*. Inquire for Canadian and other foreign rates.

## Hotel Reservation Form

### AAAS Annual Meeting ♦ Philadelphia ♦ 25–30 May 1986

Mail to: Philadelphia Convention Bureau, AAAS Housing Dept., 3 Penn Ctr. Plaza, Suite 2020, Philadelphia, PA 19102

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 \_\_\_\_\_

**Hotel Rates** (Add 9%: 6% sales and 3% occupancy tax). Indicate 1st, 2nd, and 3rd choice of hotel; check appropriate box for type of room desired.

Choice	Hotel	Single	Double or Twin	Parlor + 1 Bedrm.	Parlor + 2 Bedrms.
_____	Franklin Plaza	<input type="checkbox"/> \$69	<input type="checkbox"/> \$79	<input type="checkbox"/> \$140 & up	<input type="checkbox"/> \$365 & up
_____	Hershey Philadelphia	<input type="checkbox"/> \$69	<input type="checkbox"/> \$79	<input type="checkbox"/> \$150 & up	<input type="checkbox"/> \$219 & up
_____	Holiday Inn - Center City	<input type="checkbox"/> \$67	<input type="checkbox"/> \$77	<input type="checkbox"/> \$147 & up	—

Arrival date \_\_\_\_\_

Time \_\_\_\_\_ ☐ a.m. ☐ p.m.

Departure date \_\_\_\_\_

Time \_\_\_\_\_ ☐ a.m. ☐ p.m.

Be sure to list definite arrival and departure dates and times. Reservations will be held only until 6 p.m. unless accompanied by 1 night's deposit or major credit card guarantee.

■ Reservations must be submitted to the Housing Department (address above) on this official form by **2 May 1986**. Reservations received after this cut-off date are conditional on space availability. ■ Confirmations will come directly from the hotels. Cancellations must be sent to the Housing Department until cut-off date. Make name and date changes (and cancellations after 2 May) directly with the hotel.

■ Rollaway beds or extra person in room: Franklin Plaza, \$10; Hershey, \$10; Holiday Inn, \$7.

■ Children accommodated free of charge in same room with parents: Franklin Plaza, to age 14; Hershey and Holiday Inn, to age 18.

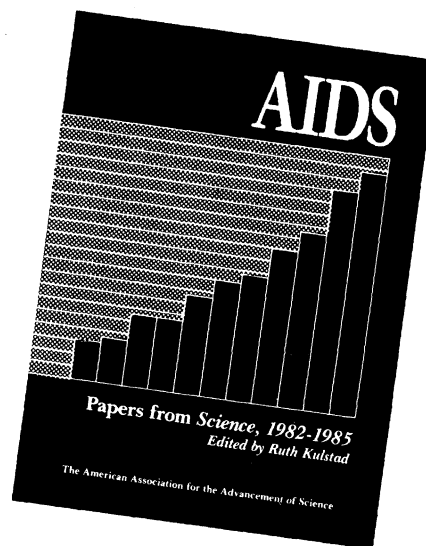


*Announcing a new book from AAAS*

# AIDS

**Papers from *Science*,  
1982–1985**

*Edited by*  
**Ruth Kulstad, *Science***



**S**ome of the most frequently cited papers on acquired immune deficiency syndrome (AIDS) that appeared in *Science* between August 1982 and September 1985 are included in this volume. Arranged chronologically, these 108 research papers and *Science* news reports show how far AIDS research has come and provide an indication of the directions in which it might go.

This fully indexed collection is useful not only for the experimental data and conclusions, but also as an excellent source of references to AIDS work in other major journals worldwide. An overview of research in AIDS to date is provided in the introduction by Dr. Myron Essex, chairman of the Department of Cancer Biology, Harvard University School of Public Health.

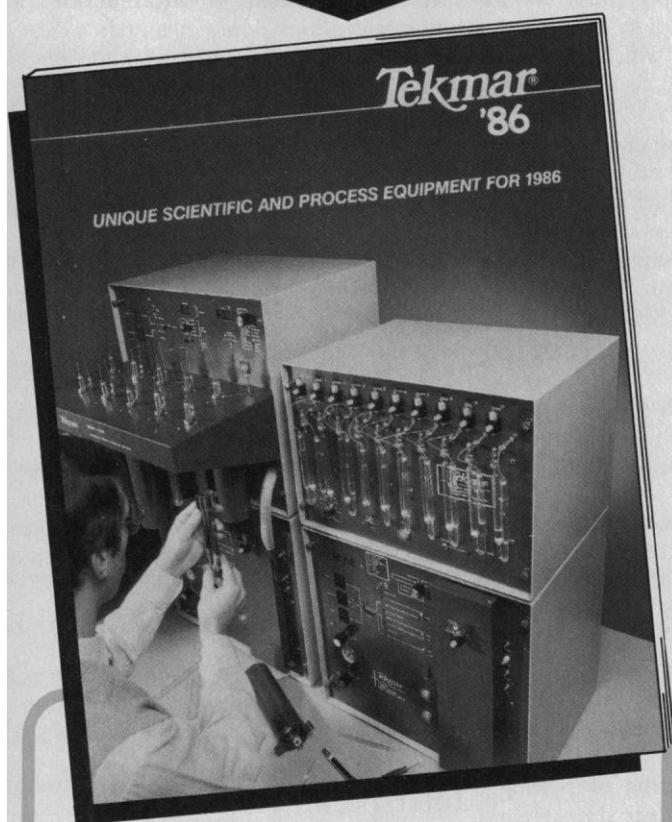
ca. 640pp.; fully indexed and illustrated  
Hardcover \$32.95, AAAS member price \$26.35  
Softcover \$19.95, AAAS member price \$15.95

Order from AAAS Marketing, Dept. A, 1333 H St., NW, Washington, DC 20005. Add \$1.50 postage and handling per order. Allow 4–6 weeks for delivery.

*American Association for the Advancement of Science*



Send for your FREE copy of our  
**NEW 1986 CATALOG**  
 and we'll send you samples  
 of our precision tips and  
 microtubes...and the  
**FREE Catalog!**



Everything you ever wanted to know  
 about TEKMAR and their diverse pro-  
 duct line is contained in this compact  
 64 page catalog.

Write us, we'll send one to you...call  
 us toll free, we'll get it right out. You will  
 be amazed at the diversity of our unique  
 product line offerings.

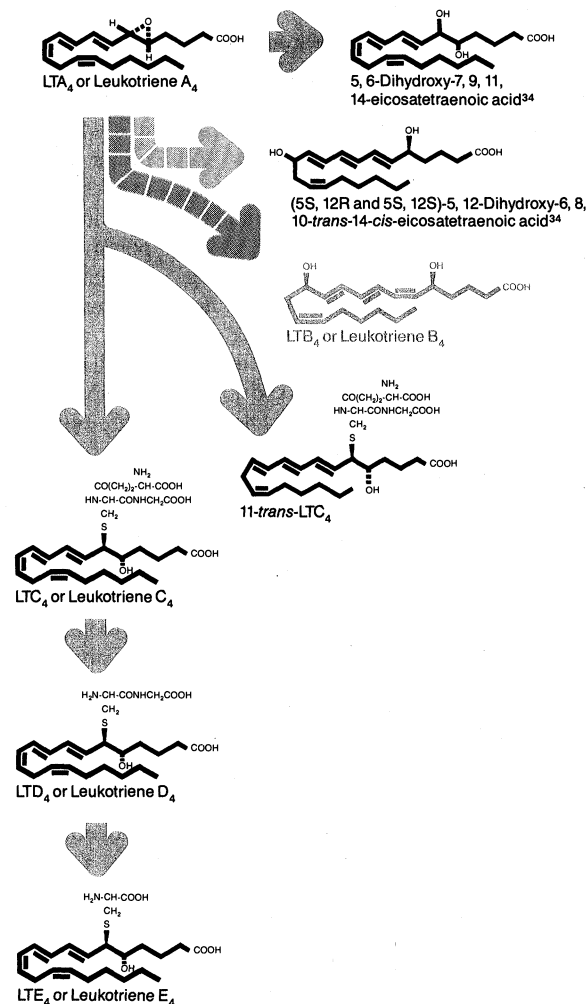
**Tekmar®**

Call Toll Free 800-543-4461  
 In Ohio, Canada call collect 513-761-0633  
 Telex No. 21-4221

Tekmar Company / P.O. Box 371856 / Cincinnati, Ohio 45222-1856

Circle No. 194 on Readers' Service Card

## Simplicity. Specificity. Now You Can Have Both with the New Leukotriene B<sub>4</sub> (<sup>3</sup>H) Assay.



For simple-to-use and specific radioimmunoassay of leukotriene B<sub>4</sub> (LTB<sub>4</sub>) in serum or tissue samples — the new LTB<sub>4</sub> Assay Kit from Upjohn Diagnostics — which can be performed conveniently at room temperature. Specially prepared charcoal with low non-specific binding provides low background counts for less interference.

The LTB<sub>4</sub> Kit's highly specific antiserum does not cross react with arachidonic acid or other leukotrienes — providing greater accuracy.

LTB<sub>4</sub> Assay is also sensitive to two picograms per assay tube. And it is quick — two hours versus a half day for others.

To order or inquire about the Upjohn Diagnostics LTB<sub>4</sub> Kit, call 616/385-7111.

Circle reader service card number 69.

Upjohn, a leader in eicosanoid research.

**Upjohn diagnostics**

For research use only. Not  
 for human or veterinary  
 clinical use.

A Division of The Upjohn Company