

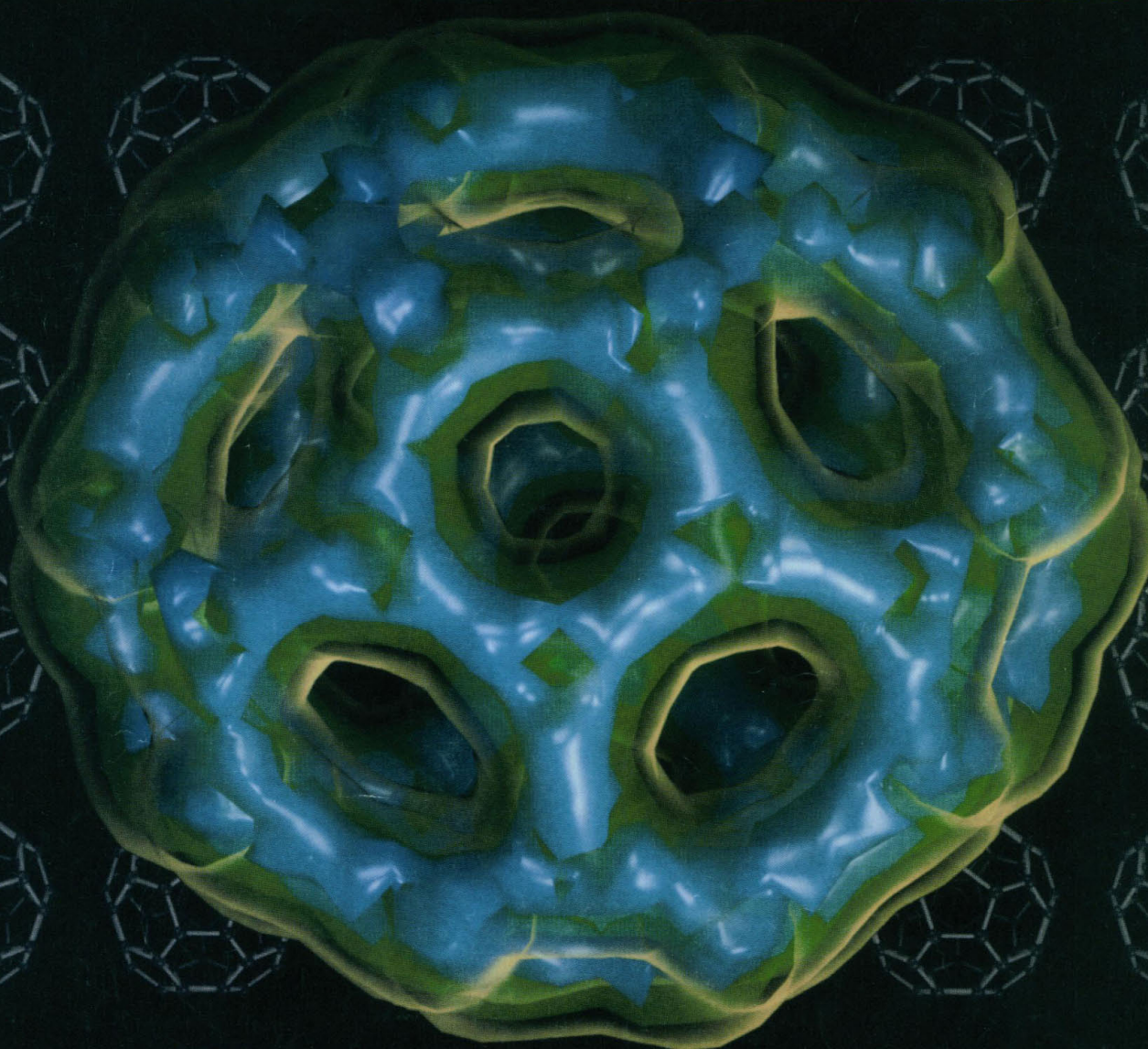
AMERICAN  
ASSOCIATION FOR THE  
ADVANCEMENT OF  
SCIENCE

# SCIENCE

20 DECEMBER 1991  
VOL. 254 ■ PAGES 1697-1860

\$6.00

## MOLECULE OF THE YEAR

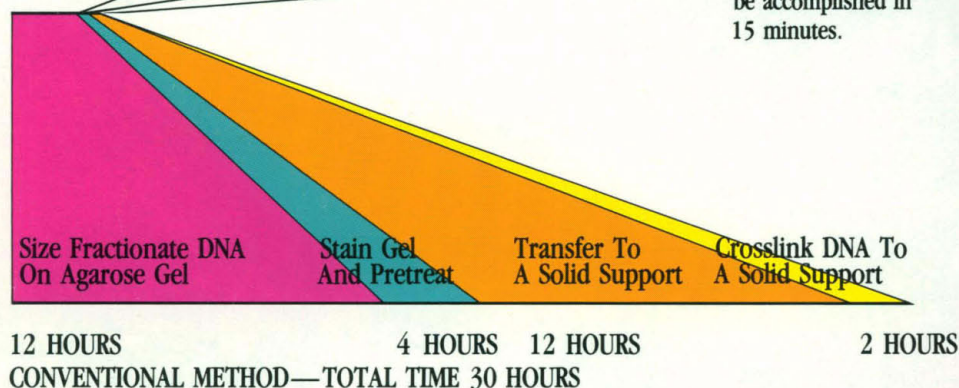




# Southerns/Northerns: Electrophoresis, Blotting, and Crosslinking in 2.5 Hours Instead of 30.

Stratagene has streamlined agarose gel electrophoresis and blotting. The system decreases the time required, from sample loading to prehybridization ten fold.

STRATAGENE METHOD—TIME 2.5 HOURS  
2 HOURS 15 MIN 15 MIN 30 SECONDS



## VAGE™ System

The VAGE™ vertical agarose/acrylamide gel electrophoresis system allows the casting of agarose or acrylamide gels in the unit. Nucleic acids can be electrophoresed through a 3 mm, 0.8 % vertical agarose gel in less than two hours with excellent resolution (Figure 1).

Because the gels are thin, staining, depurination, and denaturation can be accomplished in 15 minutes.

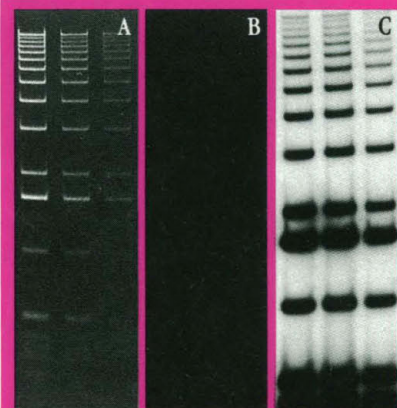


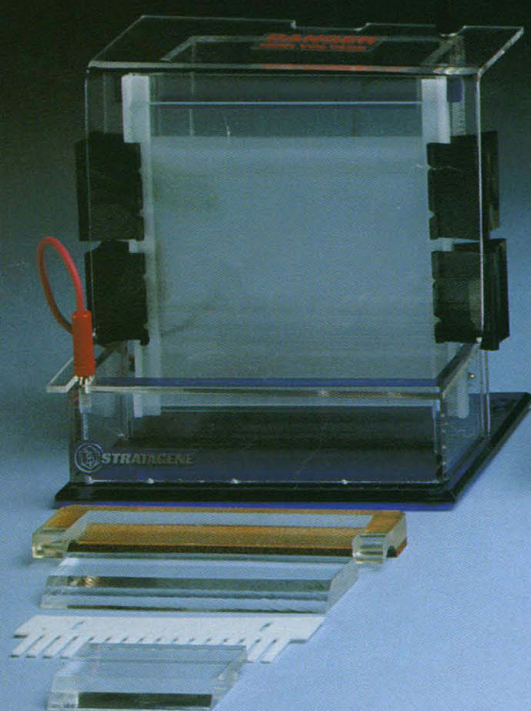
FIGURE 1:

Figure Legend: Fractionation of end labeled DNA markers on 3mm thick 0.8 % agarose by the VAGE apparatus and transfer to Duralon—UV™ membranes using the PosiBlot pressure blotter.

A. Ethidium stained gel showing high resolution.

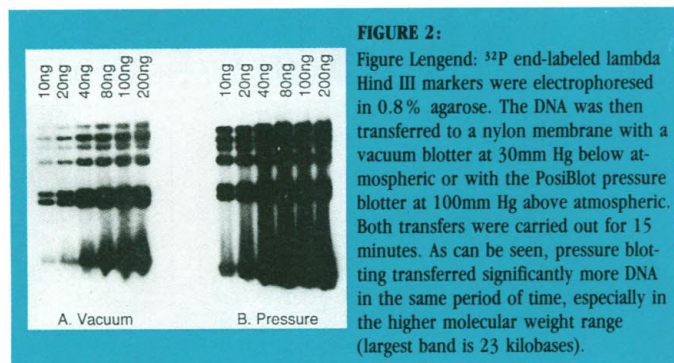
B. Same gel after pressure blotting.

C. Autoradiogram of membrane after pressure transfer.

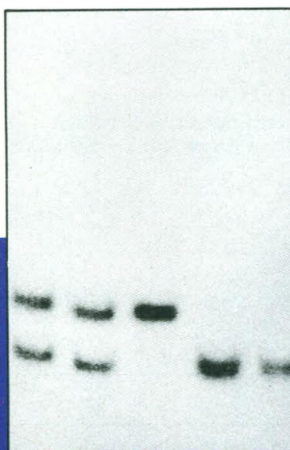




## PosiBlot™ Pressure Blotter



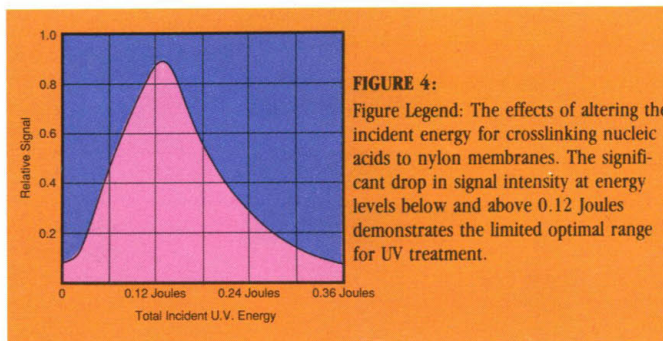
The PosiBlot™ positive pressure blotter permits the transfer of nucleic acids in 1/3 the time of vacuum blotters and 1/50 the time of capillary blotting (Figure 2). Pressure blotting does not dehydrate gels as do other methods. This allows the use of substantially higher pressure differentials, compared with vacuum blotting, without gel collapse. The PosiBlot apparatus reduces blotting time to 15 minutes.



**FIGURE 3:**  
Figure Legend: Autoradiogram showing the resolution of 2.8 and 1.3 Kb Msp I RFLP alleles revealed by a cystic fibrosis human DNA probe using the VAGE, PosiBlot and Stratalinker all in 2.5 hours.

## Stratalinker™ UV Crosslinker

The Stratalinker™ UV Crosslinker fixes nucleic acids to solid supports such as nitrocellulose or nylon membranes, in less than one minute. This compares favorably to vacuum baking, which requires 2 hours. The Stratalinker actually monitors the ultra violet energy flux and deactivates the light source upon reaching the user-programmed energy level (Figure 4). Figure 3 shows an autoradiogram of a human genomic Southern blot performed using the VAGE, PosiBlot and Stratalinker all in 2.5 hours.



Stratagene offers a full selection of nitrocellulose, reinforced nitrocellulose and nylon membranes. Each membrane is stringently lot tested to ensure consistency when performing Northern and Southern blotting. Please call Technical Services for detailed information on Stratagene's time saving blotting systems and membranes.



**STRATAGENE®**  
*Where Satisfaction Multiplies*

Corporate Headquarters:  
11099 North Torrey Pines Rd.  
La Jolla, CA 92037  
Ordering: 800-424-5444  
Tech. Services: 800-548-1113  
FAX: 619-535-5430  
TELEX: 9103809841

Stratagene GmbH  
Postfach 105466  
D-6900 Heidelberg  
(Federal Republic of Germany)  
Telephone: (06221) 40 06 34  
Telefax: (06221) 40 06 39

Stratagene Ltd.  
Cambridge Innovation Centre  
Cambridge Science Park  
Milton Road  
Cambridge CB4 4GF  
Telephone: (0223) 420955  
Telefax: (0223) 420234  
Telex: 81417 INNEN G

Please contact Stratagene  
for a distributor near you.

\* Patent Pending

Circle No. 70 on Readers' Service Card



1703 This Week in *Science*

## Editorial

1705 Molecule of the Year

## Molecule of the Year

1706 Buckyballs: Wide Open Playing Field for Chemists: E. CULOTTA AND D. E. KOSHLAND, JR.

## Letters

1710 The Human Genome Project and Patents: H. CURIEN; The Human Genome Committee and Board of Directors ■ Respect for Vitamin C: L. PAULING; G. BLOCK

## ScienceScope

1715 A new AIDS drug moves toward testing; DOE physics gets a budget reprieve; etc.

## News & Comment

1716 Soviet Science: A Struggle for Survival ■ The Academy Under Siege ■ SOS: Save Our Science  
1719 Breast Cancer: Stalemate In the War on Cancer  
1720 Canadian Biotech Regs Under Fire  
1721 Fight Erupts Over DNA Fingerprinting ■ Was *Science* Fair to its Authors?  
1724 *Briefings*: Britannica in the Doghouse ■ Accounting for the Environment ■ Beryllium Disease ■ Radar Gun Hazards? ■ Computer Moguls Slam Data Plan ■ Seal Tests ■ More on Vitamin C

## Research News

1726 On the Track of an Elusive Disease  
1728 A "Jumping Gene" Caught in the Act  
1729 HIV Risk Higher for First-Born Twins  
1730 Feverish Materialism in Snowy Boston: Fullerenes Still in Prime Time ■ This SQUID Ain't Sushi ■ Silicon's Light Touch, Continued  
1732 A Lofty Idea for Atmospheric Research

## Perspective

1735 The Utility of DNA Typing in Forensic Work: R. CHAKRABORTY AND K. K. KIDD

## Articles

1740 Foreign Direct Investment in the United States and U.S. Interests: E. M. GRAHAM  
1745 Population Genetics in Forensic DNA Typing: R. C. LEWONTIN AND D. L. HARTL  
1750 Oscillatory Kinetics and Spatio-Temporal Self-Organization in Reactions at Solid Surfaces: G. ERTL

## Research Articles

1756 Linkage of Faulty Major Histocompatibility Complex Class I to Autoimmune Diabetes: D. FAUSTMAN, X. LI, H. Y. LIN, Y. FU, G. EISENBARTH, J. AVRUCH, J. GUO  
1762 Characterization of a Cofactor That Regulates Dimerization of a Mammalian Homeodomain Protein: D. B. MENDEL, P. A. KHAVARI, P. B. CONLEY, M. K. GRAVES, L. P. HANSEN, A. ADMON, G. R. CRABTREE

## Reports

1768 Fullerene Isomerism: Isolation of  $C_{2v}$ - $C_{78}$  and  $D_{3h}$ - $C_{78}$ : F. DIEDERICH, R. L. WHETTEN, C. THILGEN, R. ERTL, I. CHAO, M. M. ALVAREZ  
1771 Long-Term Mean Vertical Motion over the Tropical Pacific: Wind-Profiling Doppler Radar Measurements: K. S. GAGE, J. R. McAFEE, D. A. CARTER, W. L. ECKLUND, A. C. RIDDLE, G. C. REID, B. B. BALSLEY  
1773 A Fungal Gene for Antibiotic Resistance on a Dispensable ("B") Chromosome: V. P. MIAO, S. F. COVERT, H. D. VANETTEN

■ **SCIENCE (ISSN 0036-8075)** 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 additional mailing offices. Copyright © 1991 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): \$82 (\$47 allocated to subscription). Domestic institutional subscription (51 issues): \$150. Foreign postage extra: Mexico, Caribbean (surface mail) \$50; Other countries (air assist delivery) \$95. First class, airmail, student and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. **Change of address:** allow 6 weeks, giving old and new addresses and 11-digit account number. **Postmaster:** Send change of address to *Science*, P.O. Box 2033, Marlon, OH 43305-2033. **Single copy sales:** \$6.00 per issue prepaid includes surface postage; Guide to Biotechnology Products and Instruments, \$20. Bulk rates on request. **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, 27 Congress Street, Salem, Massachusetts 01970. The identification code for *Science* is 0036-8075/93 \$1 + .10. *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 objectives 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, to advance education in science, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.



COVER Electron distribution in  $C_{60}$  (buckminsterfullerene) at 1000 kelvin (foreground: diameter, 7.1 angstroms), obtained from quantum molecular dynamics simulations. The colors yellow, green, and blue denote regions of successively greater electron density. The atomic structure of  $C_{60}$  (background) consists of five- and six-membered rings arranged in the shape of a soccer ball. See Editorial, page 1705, and Molecule of the Year, page 1706. [Simulations and image by J. Bernholc, Q.-M. Zhang, J.-Y. Yi, and C. Brabec, North Carolina State University, and T. Palmer, North Carolina Supercomputing Center]

- 1776 Identification and Characterization of Zinc Binding Sites in Protein Kinase C: S. R. HUBBARD, W. R. BISHOP, P. KIRSCHMEIER, S. J. GEORGE, S. P. CRAMER, W. A. HENDRICKSON
- 1779 Novel Fold and Putative Receptor Binding Site of Granulocyte-Macrophage Colony-Stimulating Factor: K. DIEDERICH, T. BOONE, P. A. KARPLUS
- 1782 Maintenance of Normoglycemia in Diabetic Mice by Subcutaneous Xenografts of Encapsulated Islets: P. E. LACY, O. D. HEGRE, A. GERASIMIDI-VAZEOU, F. T. GENTILE, K. E. DIONNE
- 1785 Regulation of Phagocytosis and  $[Ca^{2+}]_i$  Flux by Distinct Regions of an Fc Receptor: J. A. ODIN, J. C. EDBERG, C. J. PAINTER, R. P. KIMBERLY, J. C. UNKELESS
- 1788 Low Affinity Interaction of Peptide-MHC Complexes with T Cell Receptors: K. MATSUI, J. J. BONIFACE, P. A. REAY, H. SCHILD, B. FAZEKAS DE ST. GROTH, M. M. DAVIS
- 1791 Identification of a Zinc Finger Protein That Inhibits IL-2 Gene Expression: T. M. WILLIAMS, D. MOOLTEN, J. BURLEIN, J. ROMANO, R. BHAERMAN, A. GODILLOT, M. MELLON, F. J. RAUSCHER III, J. A. KANT
- 1794 Inhibition of Rap1A Binding to Cytochrome  $b_{558}$  of NADPH Oxidase by Phosphorylation of Rap1A: G. M. BOKOCH, L. A. QUILLIAM, B. P. BOHL, A. J. JESAITIS, M. T. QUINN
- 1797 Chloride Conductance Expressed by  $\Delta F508$  and Other Mutant CFTRs in *Xenopus* Oocytes: M. L. DRUMM, D. J. WILKINSON, L. S. SMIT, R. T. WORRELL, T. V. STRONG, R. A. FRIZZELL, D. C. DAWSON, F. S. COLLINS
- 1799 Inhibition of HIV Replication in Acute and Chronic Infections in Vitro by a Tat Antagonist: M.-C. HSU, A. D. SCHUTT, M. HOLLY, L. W. SLICE, M. I. SHERMAN, D. D. RICHMAN, M. J. POTASH, D. J. VOLSKY
- 1802 Long-Term Improvement of Hypercholesterolemia After ex Vivo Gene Therapy in LDLR-Deficient Rabbits: J. R. CHOWDHURY, M. GROSSMAN, S. GUPTA, N. R. CHOWDHURY, J. R. BAKER, JR., J. M. WILSON
- 1805 Isolation of an Active Human Transposable Element: B. A. DOMBROSKI, S. L. MATHIAS, E. NANTHAKUMAR, A. F. SCOTT, H. H. KAZAZIAN, JR.
- 1808 Reverse Transcriptase Encoded by a Human Transposable Element: S. L. MATHIAS, A. F. SCOTT, H. H. KAZAZIAN, JR., J. D. BOEKE, A. GABRIEL
- 1811 Pharmacological Dissociation of Modulatory Effects of Serotonin in *Aplysia* Sensory Neurons: A. R. MERCER, N. J. EMPTAGE, T. J. CAREW
- 1814 Mitotic Phosphorylation of the Oct-1 Homeodomain and Regulation of Oct-1 DNA Binding Activity: N. SEGL, S. B. ROBERTS, N. HEINTZ

## Inside AAAS

- 1818 Beyond Devils and Angels: The National Conference of Lawyers and Scientists ■ 1992 Election Results ■ Science-By-Mail ■ Barnard Scholarship

## Book Reviews

- 1820 Manufacturing Knowledge, reviewed by W. FINLAY ■ Southern Hunting in Black and White, P. F. BARLETT ■ The San Andreas Fault System, California, S. WARD ■ Reprints of Books Previously Reviewed ■ Books Received

## Products & Materials

- 1826 Microcentrifuge Filtration Devices ■ Chromatographic Simulation Software ■ Fiberglass Tissue Culture Enclosure ■ Monoclonal Antibodies ■ Tissue Slicer ■ Semi-Dry Electrobloppers ■ Literature

Author Index for Volume 254 is on pages 1848-1858

### Board of Directors

Donald N. Langenberg  
Retiring President,  
Chairman

Leon M. Lederman  
President

F. Sherwood Rowland  
President-elect

Mary Ellen Avery  
Francisco J. Ayala  
Eugene H. Cota-Robles  
Robert A. Frosch  
Joseph G. Gavin, Jr.  
Florence P. Haseltine  
Jean'ne M. Shreeve  
Warren M. Washington

William T. Golden  
Treasurer

Richard S. Nicholson  
Executive Officer

### Editorial Board

Charles J. Arntzen  
Elizabeth E. Bailey  
David Baltimore  
William F. Brinkman  
E. Margaret Burbidge  
Pierre-Gilles de Gennes  
Joseph L. Goldstein  
Mary L. Good  
Harry B. Gray  
John J. Hopfield  
F. Clark Howell  
Paul A. Marks  
Yasutomi Nishizuka  
Helen M. Ranney  
Robert M. Solow  
Edward C. Stone  
James D. Watson

### Board of Reviewing Editors

John Abelson  
Frederick W. Alt  
Don L. Anderson  
Stephen J. Benkovic  
David E. Bloom  
Floyd E. Bloom  
Henry R. Bourne  
James J. Bull  
Kathryn Calame  
Charles R. Cantor  
C. Thomas Caskey  
Dennis W. Choi  
Ralph J. Ciccone  
John M. Coffin  
Bruce F. Eldridge  
Paul T. Englund  
Fredric S. Fay

Douglas T. Fearon  
Harry A. Fozzard  
Victor R. Fuchs  
Theodore H. Geballe  
Margaret J. Geller  
Roger I. M. Glass  
Stephen P. Goff  
Corey S. Goodman  
Stephen J. Gould  
Ira Herskowitz  
Eric F. Johnson  
Stephen M. Kosslyn  
Konrad B. Krauskopf  
Charles S. Levings III  
Harvey F. Lodish  
Richard Losick  
Anthony R. Means  
Mortimer Mishkin  
Roger A. Nicoll  
William H. Orme-Johnson III

Stuart L. Pimm  
Yeshayau Pocker  
Dennis A. Powers  
Ralph S. Quatrano  
Erkki Ruoslahti  
Thomas W. Schoener  
Ronald H. Schwartz  
Terrence J. Sejnowski  
Thomas A. Steitz  
Richard F. Thompson  
Robert T. N. Tjian  
Emil R. Unanue  
Geerat J. Vermeij  
Bert Vogelstein  
Harold Weintraub  
Zena Werb  
George M. Whitesides  
Owen N. Witte  
William B. Wood  
Keith Yamamoto





## Eppendorf® spins out two new winners.

**Two new Micro Centrifuges that make your work faster, easier, and safer.**

**One has refrigeration.** The new Model 5402 Refrigerated Micro Centrifuge spins heat-sensitive samples at temperatures as low as  $-9^{\circ}\text{C}$ ,\* bringing the cold room to your benchtop.

**Both control aerosols.** The refrigerated model and the new Model 5415C Micro Centrifuge both use new, easily interchangeable rotors with lids for added quiet, convenience, and safety.

Call 800-645-3050; in New York, 516-334-7500, for more information. Or write Brinkmann Instruments, Inc., Cantiague Road, Westbury, NY 11590. (In Canada: 416-675-7911; 50 Galaxy Blvd., Rexdale, Ont. M9W 4Y5)

\*At 12,500 rpm.

**eppendorf**

**BRINKMANN** Quality products for research and control.

For information circle reader service number 71  
For a demonstration circle reader service number 72



## This Week in SCIENCE

### DNA fingerprinting

**F**orensic scientists are using DNA typing as a way to conclusively link a suspect to a crime, including the use of variable number of tandem repeats (VNTRs). Lewontin and Hartl (p. 1745) contend that until more extensive sampling of VNTR frequency distributions is done in various ethnic groups, probability estimates of a match between an individual and evidence from a crime scene, as currently calculated, may not be reliable. In a Perspective, Chakraborty and Kidd (p. 1735) argue that courtroom applications of DNA typing, when done with care, can provide overwhelming evidence that cannot be coincidental [see news story by Roberts (p. 1721)].

### Surface kinetics

**O**xidation of CO to CO<sub>2</sub> by O<sub>2</sub> might seem to be a simple chemical reaction, but in a review Ertl (p. 1750) shows that this reaction displays nonlinear, time-dependent kinetics when catalyzed by the Pt (110) surface. Depending on temperature and reactant partial pressure, the oxidation rate can become oscillatory or even chaotic. Imaging with a photoemission electron microscope revealed chemical wave phenomena, such as spiral wave patterns and solitary waves.

### Diabetes

**T**ype I, or autoimmune, diabetes appears to be associated with a lack of expression of major histocompatibility complex (MHC) class I molecules on pancreatic islet cells. Faustman *et al.* (p. 1756) observed deficient expression of MHC class I molecules in prediabetic and hyperglycemic nonobese diabetic (NOD) mice, in  $\beta_2$ -microglobulin-deficient mice, and in humans. In the NOD mouse a mutation occurs in an MHC class II-linked gene, but that mutation is in the putative transporter for MHC class I peptide. In genetically identical human

twins, the defect appears to be with the antigen presenting cell. In another study, Lacy *et al.* (p. 1782) describe how the implantation of encapsulated donor islet cells under the skin of diabetic mice can be used to maintain normal blood sugar levels. The islet cells were encapsulated in a gel and loaded in hollow acrylic fibers. The freely permeable sodium alginate gel prevented the aggregation of islet cells that could lead to a loss of function.

### Dimer regulation

**F**ormation of the active, dimerized form of a mammalian homeo-domain protein, hepatocyte nuclear factor-1 $\alpha$  (HNF-1 $\alpha$ ), appears to be regulated by a cofactor, DCoH. Mendel *et al.* (p. 1762) describe the purification, cloning, and characterization of DCoH, which copurifies with HNF-1 $\alpha$  from liver extracts. Rather than binding to DNA by itself, DCoH promotes dimerization of HNF-1 $\alpha$  by formation of tetrameric complexes. The transcriptional activity of HNF-1 $\alpha$  is enhanced by DCoH dimerization even though the DNA binding of HNF-1 $\alpha$  is left unchanged. Association of HNF-1 $\alpha$  with DCoH may reveal an activation surface that is not present in its absence.

### Fullerene isomers

**U**nlike the other fullerenes, C<sub>78</sub> can occur in two different geometrical arrangements. Diederich *et al.* (p. 1768) isolated C<sub>78</sub> and found a major component with symmetry C<sub>2v</sub> and a minor component with symmetry D<sub>3h</sub>, as determined by carbon-13 nuclear magnetic resonance. Theoretical calculations had predicted a single isomer of symmetry D<sub>3h</sub>.

### Doppler radar

**M**easurements of vertical motions of the atmosphere are needed to study the effects of the solar energy budget, clouds, and

rainfall on large-scale circulation of the troposphere and stratosphere and mass exchange across the tropopause. Gage *et al.* (p. 1771) used Doppler radar to show that motion in the troposphere is upward in the western Pacific, above Phompei, and downward above Christmas Island, in the central Pacific Ocean, but that an opposite pattern is evident in the stratosphere. This pattern shifts during El Niño; cirrus clouds form over Christmas Island and act to expand the region of downward motion in the lower troposphere and inhibit vertical motion in the stratosphere.

### Low affinity

**T**he low affinity of T cell receptors (TCRs) for their antigens makes measurement of their dissociation constants difficult, but an assay developed by Matsui *et al.* (p. 1788) has yielded values of  $4 \times 10^{-5}$  to  $6 \times 10^{-5}$  molar. The ligands for the TCR are peptides bound to the major histocompatibility complex (MHC). The concentration of membrane-bound MHC is hard to quantitate, but the use of soluble MHC molecules allowed a competition assay to be performed. The low affinity suggests that antigen-independent adhesion between the T cell and the targeted cell precedes antigen recognition.

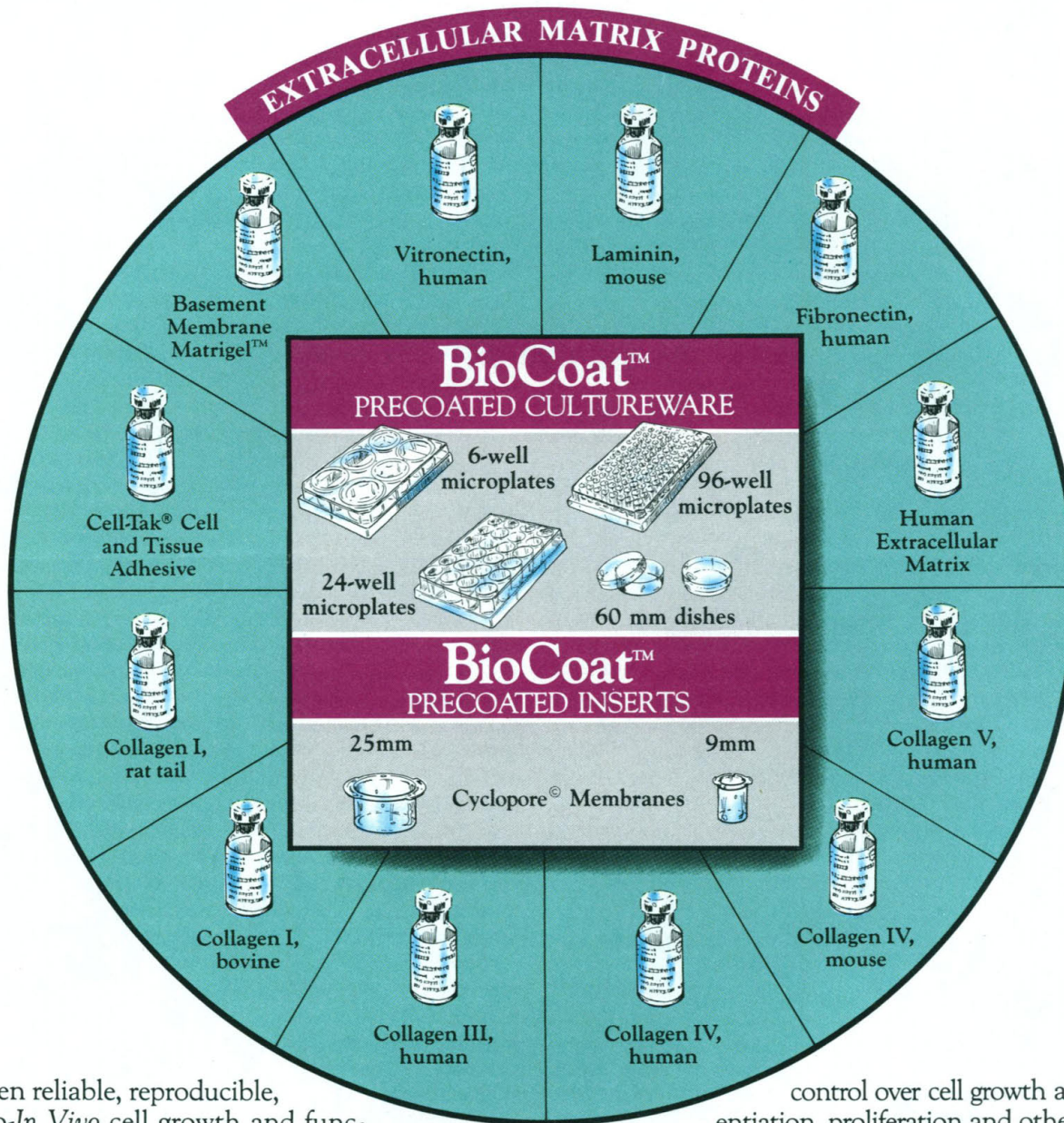
### Transposable element

**A**n active human transposable element encodes reverse transcriptase (RT) activity. Dombroski *et al.* (p. 1805) isolated a long interspersed (L1) element that had caused a recent mutation to hemophilia A by inserting into the factor VIII gene. This L1 element contains two open reading frames that can each produce a protein product. Mathias *et al.* (p. 1808) used yeast genetics to show that one of these products has RT activity. Thus, L1 elements may represent a source of RT for retrotransposition in a number of RNA-mediated processes [see news story by Holzman (p. 1728)].



# All the **EXTRACELLULAR MATRIX PRODUCTS**

You Need for Convenient, Consistent, Closer-to-*In Vivo* CELL CULTURE



When reliable, reproducible, close-to-*In Vivo* cell growth and function are important to your studies, turn to Collaborative Biomedical Products. We offer a complete line of extracellular matrix protein materials and ECM-coated cultureware that can give you a new level of

control over cell growth and differentiation, proliferation and other characteristics. In coating its multi-well plates, dishes and membrane inserts, Collaborative Biomedical Products uses a proprietary technique that ensures optical clarity and a high degree of coating uniformity.

*More Innovative Products for Cell Science Research from...*



Becton Dickinson Labware

**BECTON  
DICKINSON**

Circle No. 66 on Readers' Service Card

Two Oak Park, Bedford, MA 01730  
800-343-2035 • (Fax) 617-275-0043



# Pure mRNA in Minutes...

## ...Directly from Small or Large Samples of Cells or Tissue.

FastTrack™ and MicroFastTrack™ set the industry standard in high quality mRNA isolation.

### MicroFastTrack™\*: 20 Reactions

- Ideal for PCR, Northern and cDNA synthesis
- Isolation from samples ranging in size from  $10^{-3}$  to  $10^6$  cells or 10-250mg of tissue.
- Reproducible yields of high quality mRNA.

### FastTrack™\*: 6 Reactions

- mRNA isolation for Northern, cDNA, library construction, PCR, microinjection, RNA protection studies and *in vitro* translation.
- Isolation from samples ranging in size from  $10^7$  to  $10^8$  cells or 0.4-1.0 gram of tissue.
- Fast, efficient recovery of large amounts of polyA+ RNA from a variety of sources.

### Both systems offer:

- High yields of intact mRNA with low ribosomal contamination.
- Eliminate the need for total RNA isolation or the use of toxic chemicals.
- The most cost effective means of generating high quality mRNA.
- Consistency, convenience and the fastest isolation time.

For the very best in direct mRNA isolation FastTrack™ and MicroFastTrack™ are the choice of thousands of research labs worldwide. When the quality of your mRNA is important, turn to the original source for purity, reliability and convenience; turn to Invitrogen.

**Toll Free 1-800-955-6288**

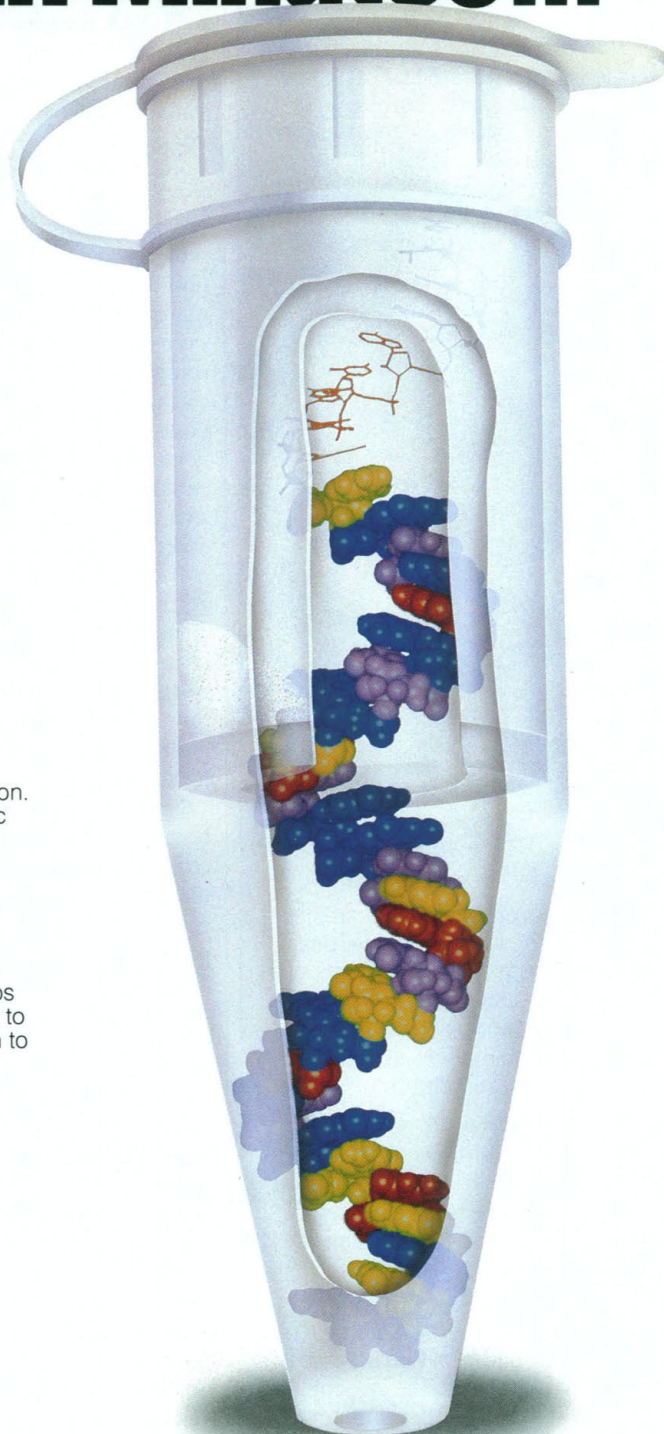


3985 • B Sorrento Valley Blvd. • San Diego, CA 92121  
(619) 597-6200 Phone • (619) 597-6201 Fax

 BRITISH BIOTECHNOLOGY LTD, UK - TEL: 44-235529449 • AMS BIOTECHNOLOGY UK LTD, UK - TEL: 44-993822786 • BDH INC., CANADA - TEL: 800-268-0310 • BIO-TRADE, AUSTRIA - TEL: 43-2228284694 • CELBIO, ITALY - TEL: 39-24048646 • FUNAKOSHI PHARMACEUTICALS, JAPAN - TEL: 81-356841622 • ITC BIOTECHNOLOGY GMBH, GERMANY - TEL: 06221-303907 • KEBO LABS AB, SWEDEN - TEL: 46-86213400 • MEDOS COMPANY PTY LTD, AUSTRALIA - TEL: 61-38089077

\*patent pending. mRNA model courtesy of BIOSYM

Circle No. 57 on Readers' Service Card





# Hard Copy your PCR products with one-step TA Cloning™\*.

## A Universal System for Cloning PCR Products

Direct hard copy cloning of PCR\* products into the multifunctional pCR2000™ vector is now possible with the new TA Cloning kit from Invitrogen. This system eliminates inefficient, time consuming reactions normally involved in cloning PCR products and allows direct cloning of amplified nucleic acids from genomic DNA, cDNA or recombinant lambda, cosmids and YACs.

TA Cloning requires:

- /// NO purification of PCR products
- /// NO modification of primers to incorporate restriction sites
- /// NO restriction enzyme digestion
- /// NO modifying enzymes
- /// NO sequence information

The TA Cloning system from Invitrogen allows blue/white color selection of recombinants from the pCR2000 vector and is useful for most PCR reactions including:

• Symmetric PCR • Inverse PCR • Alu PCR • Sequence independent PCR • mRNA PCR • Sequence Tagged Site PCR • Anchored PCR

TA Cloning is an ideal system for direct sequencing and expression of PCR products and provides a means of safeguarding precious samples for future analysis, probe generation or other manipulations. The prepared pCR2000 vector is designed to take advantage of the universal ragged ends generated by the terminal transferase activity inherent

in thermophilic polymerases. Each kit contains prepared pCR2000 vector, ligation reagents and competent *E. coli* for 20 reactions. For more information on these and other PCR products call;

Toll Free **1-800-955-6288**

3985 • B Sorrento Valley Blvd.  
San Diego, CA 92121

(619) 597-6200 Phone • (619) 597-6201 Fax



**Invitrogen**  
CORPORATION

BRITISH BIOTECHNOLOGY LTD, UK - TEL: 44-235529449 • AMS BIOTECHNOLOGY UK LTD, UK - TEL: 44-993822786 • BDH INC., CANADA - TEL: 800-268-0310 • BIO-TRADE, AUSTRIA - TEL: 43-2228284694 • CELBIO, ITALY - TEL: 39-24048646 • FUNAKOSHI PHARMACEUTICALS, JAPAN - TEL: 81-356841622 • ITC BIOTECH GMBH, GERMANY - TEL: 06221-303907 • KEBO LABS AB, SWEDEN - TEL: 46-86213400 • MEDOS COMPANY PTY LTD, AUSTRALIA - TEL: 61-38089077

\*PCR is covered by U.S. Pat. #'s 4,683,202 and 4,683,195 issued to Cetus Corporation.

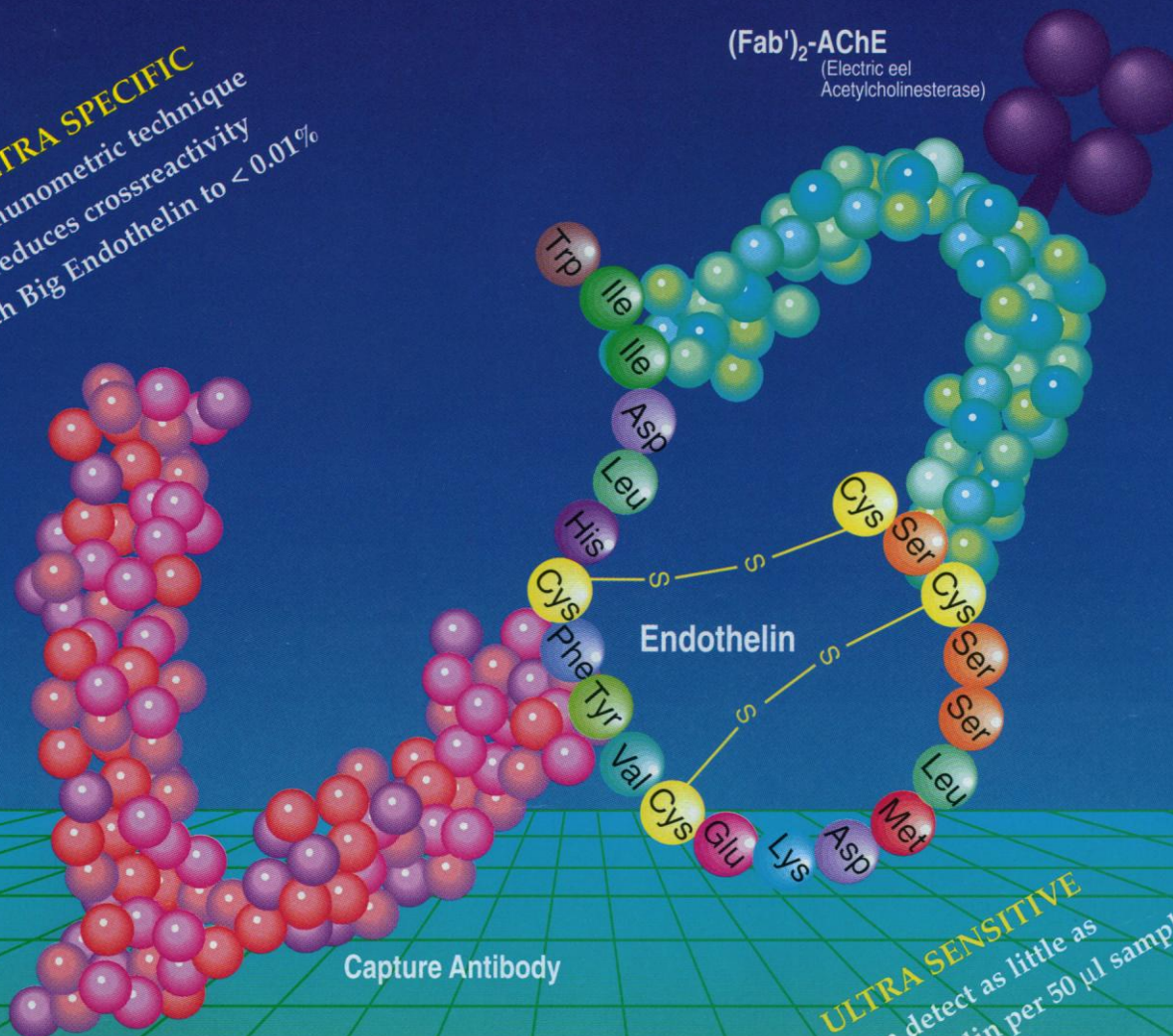
Circle No. 58 on Readers' Service Card



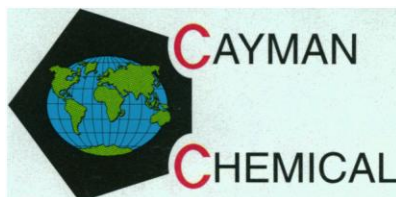
Our New, Sensitive Immunometric Assay for...

# ENDOTHELIN

**ULTRA SPECIFIC**  
Immunometric technique  
reduces crossreactivity  
with Big Endothelin to < 0.01%

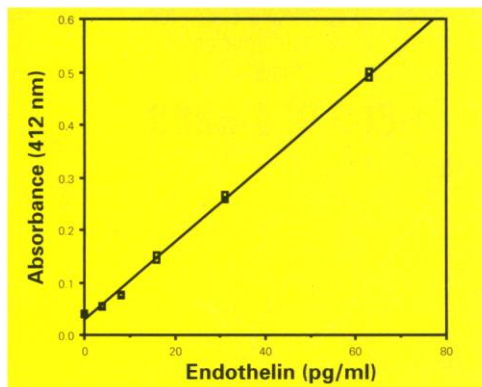


**ULTRA SENSITIVE**  
Can detect as little as  
0.1 pg Endothelin per 50 µl sample



Cayman Chemical Company  
2280 Peters Road  
Ann Arbor, MI 48103 USA

Phone: (313) 662-6756  
Fax: (313) 662-6896



**Catalog # 483151**

**Price:**

**100 determinations**

Quantity	Price/Kit
1-4	\$290.00
5-9	\$261.00
10+	\$203.00

**500 determinations**

Quantity	Price/Kit
1-4	\$975.00
5-9	\$877.50
10+	\$682.50

*Over a Decade of Service to Biochemical Research*

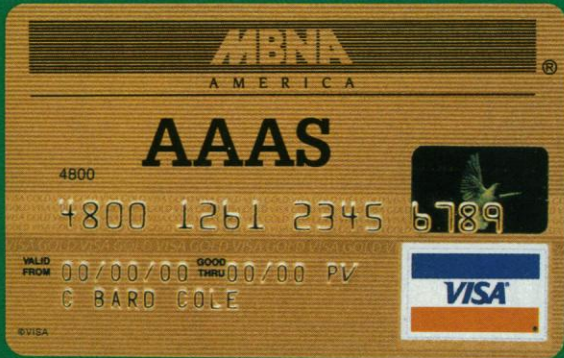
Circle No. 35 on Readers' Service Card



# GET THE AAAS VISA® CARD

## AND NEVER PAY AN ANNUAL FEE!\*

Enjoy the exceptional benefits of the AAAS Visa® Card with no annual fee for the first year,\* and every year thereafter when you charge at least \$3,000 on your AAAS Visa Card.



Receive no finance charges on purchases made with the AAAS Visa Card if your entire balance is paid on time each month (excluding cash advances).

**APPLY TODAY!**

24 hours a day, 7 days a week

**1-800-847-7378, ext 5000**

Be sure to use the priority code when calling: **TQOQ**

Certain restrictions apply to these benefits. MBNA America® is a federally registered Service Mark of MBNA America Bank, N.A. The account is issued and administered by MBNA America Bank, N.A. Visa® is a federally registered Service Mark of Visa U.S.A., Inc., used pursuant to license.

Call now to apply, or if you prefer, complete the application below and mail to: MBNA America, P.O. Box 15464, Wilmington, DE 19885-9440.

### PRIMARY APPLICANT SECTION (Please print)

**Yes!** I wish to apply for the AAAS Visa® Gold card with all the benefits described above. Should my application for the Visa Gold card not be approved, this request constitutes my application for the Visa Classic. (Please print)

TQOQ  
06-907  
34-271

NAME AS YOU WOULD LIKE IT TO APPEAR ON CARD

FIRST \_\_\_\_\_ MIDDLE INITIAL \_\_\_\_\_ LAST \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

HOME PHONE ( ) \_\_\_\_\_ BUS. PHONE ( ) \_\_\_\_\_

ARE YOU: ☐ Renting ☐ Own ☐ Buying Monthly Payment \$ \_\_\_\_\_

SOCIAL SECURITY # \_\_\_\_\_

DATE OF BIRTH \_\_\_\_\_

PRESENT EMPLOYER \_\_\_\_\_

NATURE OF BUSINESS \_\_\_\_\_

POSITION \_\_\_\_\_

YEARS THERE \_\_\_\_\_ ANNUAL INCOME \$ \_\_\_\_\_

OTHER INCOME\* \$ \_\_\_\_\_

SOURCE \_\_\_\_\_

\*(Alimony, child support, or separate maintenance income need not be revealed if you do not wish it considered as a basis of repayment.)

PREVIOUS EMPLOYER \_\_\_\_\_  
(If less than 3 years at current employment.)

PREVIOUS ADDRESS \_\_\_\_\_  
(If at present address less than 3 years.)

MOTHER'S MAIDEN NAME \_\_\_\_\_  
(For use when you request special action taken on your account.)

CURRENT CREDIT CARD ACCOUNTS

☐ MasterCard\* ☐ Visa\* ☐ American Express\*

I have read this entire application, agree to its terms, and certify the information is correct.

☒ (Seal)  
APPLICANT'S SIGNATURE \_\_\_\_\_ Date \_\_\_\_\_

### CO-APPLICANT SECTION (Please print)

Use this section to request extra cards. If you wish an additional card issued to a co-applicant over 18 years of age, complete the information below.

CO-APPLICANT'S NAME AS YOU WOULD LIKE IT TO APPEAR ON CARD

FIRST \_\_\_\_\_ MIDDLE INITIAL \_\_\_\_\_ LAST \_\_\_\_\_

RELATIONSHIP TO APPLICANT \_\_\_\_\_ SOCIAL SECURITY # \_\_\_\_\_

EMPLOYER \_\_\_\_\_ YRS. THERE \_\_\_\_\_

POSITION \_\_\_\_\_ ANNUAL SALARY \$ \_\_\_\_\_

WORK PHONE ( ) \_\_\_\_\_

OTHER INCOME\* \$ \_\_\_\_\_  
\*(Alimony, child support, or separate maintenance income need not be revealed if you do not wish it considered as a basis of repayment.)

SOURCE OF OTHER INCOME \_\_\_\_\_

I have read this entire application and agree to its terms, and understand that I will be jointly and severally liable for all charges on the account.

☒ (Seal)

CO-APPLICANT'S SIGNATURE \_\_\_\_\_ Date \_\_\_\_\_

I (We) authorize MBNA America® to investigate any facts, or obtain and exchange reports regarding this application or resulting account with credit reporting agencies and others. Upon request I (we) will be informed of each agency's name and address.

* Annual Fees	Annual Percentage Rate	Grace Period For Repayment Of Balances For Purchases	At least 25 Days from statement closing date	Transaction Fee For Cash Advances, And Fees For Paying Late or Exceeding The Credit Limit	Transaction Fee For Bank and ATM Cash Advances: 2% of each Cash Advance, \$2 Minimum, \$25 Maximum; Transaction Fee For access check Cash Advances: 1% of each Cash Advance, \$2 Minimum, \$10 Maximum. Late Payment Fee: \$15, Over-the-Credit-Limit Fee: \$15.
\$40 Gold; \$20 Classic (Fee waived first year and each year at least \$3,000 is charged on the AAAS card.)	16.9%	Method of Computing the Balance for Purchases	Average Daily Balance (including new purchases)		

The information about the cost of the card described in this application is accurate as of 8/91. This information may have changed after that date. To find out what may have changed, call 1-800-847-7378, ext. 5000.





# ANNOUNCING INTERNATIONAL SYMPOSIUM ON MOLECULAR CYTOGENETICS

February 6-8, 1992  
Lake Tahoe, California

A three day Molecular Cytogenetics Symposium, organized by Drs. David Ledbetter and Hunt Willard that will feature the following speakers and topics:

## **In Situ Hybridization: Techniques and Applications**

- ☐ Dan Pinkel      ☐ Dave Ward
- ☐ David Callen      ☐ Kathy Klinger

## **Chromosome Structure and Behavior**

- ☐ Hunt Willard      ☐ William Brown      ☐ Robin Lovell-Badge
- ☐ Terry Hassold      ☐ Chris Tyler-Smith

## **Clinical Cytogenetics**

- ☐ Robb Nicholls      ☐ David Ledbetter      ☐ Beverly Emanuel
- ☐ Steve Warren      ☐ Andrea Ballabio

## **Cancer Cytogenetics**

- ☐ Janet Rowley      ☐ Cynthia Morton
- ☐ Jeff Trent      ☐ Michelle LeBeau

*For more information, please contact Betty Wolf  
at ONCOR, INC. at (800)-776-6267, (301)-963-3500,  
Fax (301) 926-6129*



---

209 Perry Parkway Gaithersburg, MD 20877



**Software Digest**

**RATINGS REPORT**  
The Independent Comparative Ratings Report for Selecting IBM PC Business Software

Volume 8, Number 5

**STATISTICS PROGRAMS**

Statistical programs present a high degree of complexity that limits their use. Some of the test programs have been modified to minimize that complexity, but to a large extent they remain complicated. Programs originating in mainframe environments make few concessions to the PC environment and PC users.

- Systat balances power and usability; SAS provides great power to users who master it; and Statgraphics is the easiest to learn and use. NSTL does not recommend the other programs for PC use except in businesses already running the mainframe version.
- Four of the statistics packages are sold as modules, and prices range from \$200 to over \$4,000 for a complete set. Refer to the Program Module Chart on page 10.
- Contrary to the common belief among statisticians, great differences in calculation speed separate the programs. Calculation speed can be very important to users who run frequent analysis of large data sets. (Performance Results, page 32).

Place this report in your binder behind the Miscellaneous Software tab divider.

Program	Version	Performance	Quality	Usability	Value	Price	Features	Recommendations
*** 7.7.7.5 Systat	5	5	5	5	5	600KB \$895-\$3,270 modular	30	30
*** 7.2.7.3 SAS Applications System	6	5	5	5	5	640KB \$4,870 modular	24	24
*** 7.2.5.8 Statgraphics	pre-5	5	5	5	5	640KB \$995	28	28
*** 6.6.6.4 SPSS/PC+	4.0	5	5	5	5	512KB \$195-\$3,040 modular	26	26
*** 5.0.0.0 PC 30	1990	5	5	5	5	512KB \$2,195 modular	22	22

**Ratings Key**  
(On a scale of 0 to 10)  
**OVERALL EVALUATION**  
★★★★ 9.0 or higher  
★★ 6.0-6.9  
★ 5.0-5.9  
**ALL OTHER RATINGS**  
■ 7.0-9.9  
■ 5.0-6.9  
■ under 5.0

**Contents**

Overview	3-12
Recommendations	3
Power/Usability Chart	5
Ratings Analyses	13-19
Program Reports	20-31
Performance/Quality	32-40

**If you need statistical software, this is a statistic you should know.**

SYSTAT is rated #1 by Software Digest®. In fact, SYSTAT is the only statistical analysis package to receive top honors from InfoWorld, PC Magazine and PC Week. According to Software Digest: "It is the only program that successfully blends robust features, good usability and performance, and many areas of uncommon strength from analytical graphs to powerful programming."

SYSTAT. The statistics speak for themselves.

For more information call or write: SYSTAT, Inc. 1800 Sherman Avenue,  
Evanston, IL 60201-3793 Tel. 708.864.5670 Fax: 708.492.3567

**SYSTAT**®

For international representatives call: Australia 61.3.8661766, Canada 416.424.1700, Denmark 45.64.406575, Finland 358.0.6923800 France 33.1.40935000, Germany 49.61.265950 (DOS), 49.30.310423 (Mac), Italy 39.587.213640, Japan 81.33.5902311, New Zealand 64.71.562675, Norway 47.3.892240, Sweden 46.7.6076207, Switzerland 41.31.416611, The Netherlands 31.340.266336, UK London 44.81.6926636.

©1991 SYSTAT, Inc. Software Digest is a registered trademark of NSTL, Inc.

Circle No. 73 on Readers' Service Card