

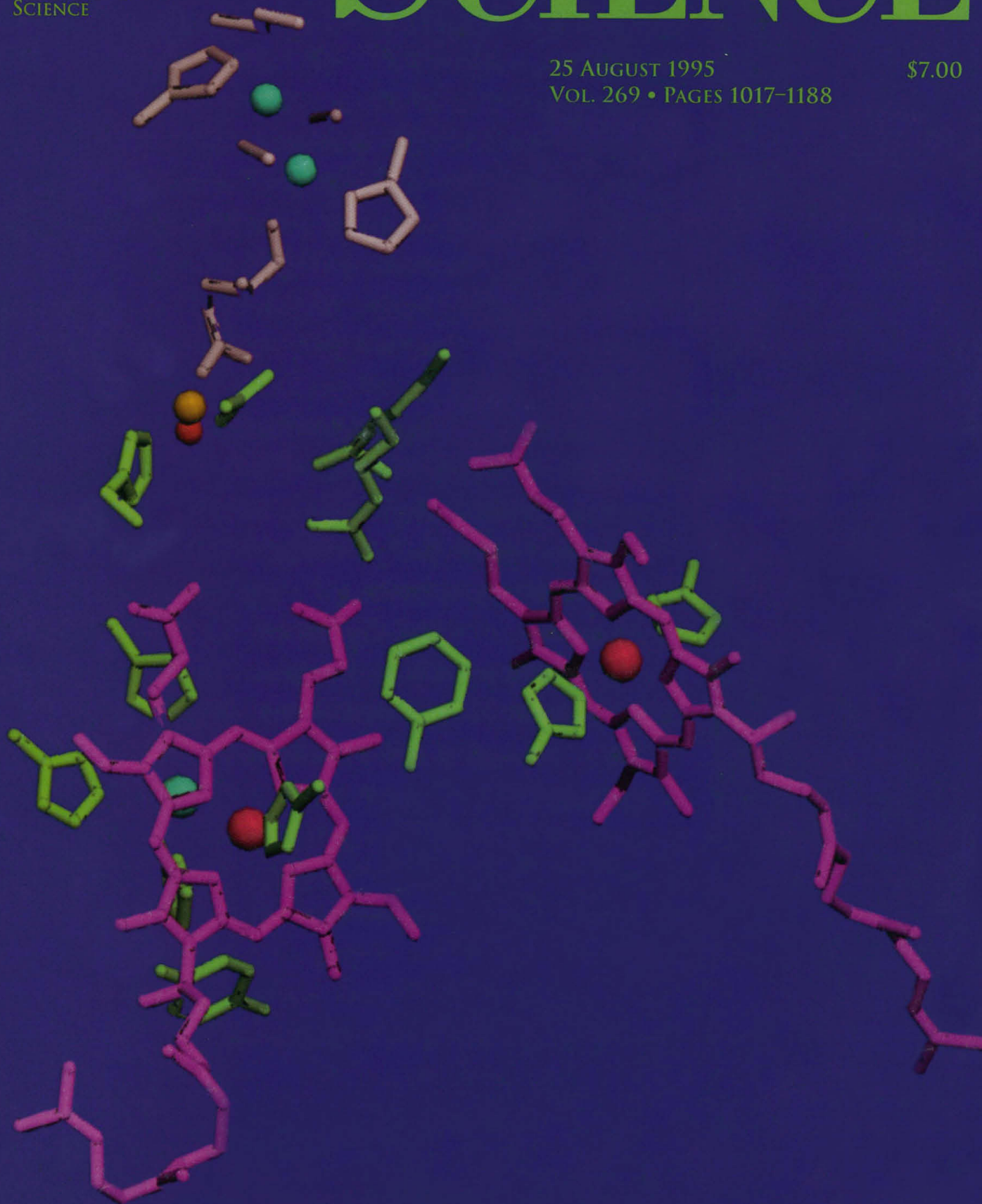


AMERICAN
ASSOCIATION FOR THE
ADVANCEMENT OF
SCIENCE

SCIENCE

25 AUGUST 1995
VOL. 269 • PAGES 1017-1188

\$7.00



Isotopic Analysis - Still Your Best Choice!

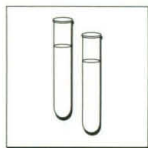


Sweeping Changes Revitalize Radioisotopic Analysis

Time-Resolved Liquid Scintillation Counting (TR-LSC®) replaces traditional LSC methods. Today, Packard Tri-Carbs count each sample in a "Surround TR-LSC" detector. This virtually eliminates background and increases counting sensitivity by a factor of 10 to 100. When combined with biodegradable Ultima Gold® cocktails, Surround TR-LSC detectors dramatically reduce isotope and cocktail usage. Waste disposal costs are cut to an absolute minimum, and more assays can be performed with much less work. Tri-Carb LSC's control their own performance automatically.



Computer Based RadioAssay (COBRA®) Gamma Counters overcome the need to count gamma samples in replicates. A built-in computer automatically controls the quality of the counting results, and through the "Open Database" architecture of its ChroniCal™ software, COBRA gamma counters network directly with your host computer or robotic sample processors such as the MultiPROBE®. This unique combination, hands-off sample processing and self-testing of counting performance, ensures precise results all of the time — even from singlicate samples.



Radio-HPLC Detection with Multichannel Analysis replaces conventional detection of radiochromatography signals with dynamic spectrum analysis. This unique capability of Packard's Radiomatic® detectors enhances detection specificity by eliminating interferences, and increases sensitivity by spectral discrimination of signal and noise. Controlled by a PC workstation with Windows based chromatography software, the new Radiomatic detectors provide a four to ten fold increase in sensitivity and throughput over conventional systems.



Direct Microplate Counting of Radioisotopic Samples dramatically enhances sample throughput. With Packard's Matrix and TopCount systems, you can measure up to 96 samples simultaneously, with or without scintillation cocktail. Better yet, you can run many assays separation-free, in one step. Just mix and measure. This extends the capabilities of these new radioisotopic instruments far beyond those of non-isotopic systems. Throughput can increase 100 fold, sample volume reduces by a factor of ten, and all mixed waste disposal problems are virtually eliminated.



PACKARD
A Canberra Company

Packard Instrument Company, 800 Research Parkway, Meriden, CT 06450 U.S.A.
Tel: 203-238-2351 Toll Free: 1-800-323-1891 TX: 643251 FAX: 203-639-2172



Packard International Offices:

Australia, Mt Waverley 61-3-543-4266; **Austria**, Vienna 43-1-2702504; **Belgium**, Brussels 32-2-4668210; **Canada**, Ontario 1-800-387-9559; **Denmark**, Greve 45-42909023; **France**, Rungis (33) 1 46.86.27.75; **Germany**, Frankfurt (49-69) 663010; **Italy**, Milano 39-2-33910796/7/8; **Japan**, Tokyo 81-3-3866-5850; **Netherlands**, Groningen 31-50-413360; **Tilburg** (013) 423900; **Russia**, Moscow, 7-095-238-7335; **Switzerland**, Zurich (01) 481 69 44; **United Kingdom**, Pangbourne, Berks (44) 0734 844981.

Circle No. 22 on Readers' Service Card

Sourcing molecular biology products?

This is the right place to start.



The new molecular biology products catalog from R&D Systems

R&D Systems introduces its own range of high quality, high performance molecular biology products, developed and manufactured to GLP or GMP standards.

A must for molecular biologists, this new catalog is an easy-to-use buyers guide which details the tools that you need to progress your molecular biology research, whether you are just starting out or if you already have many years experience behind you.

Featured in this catalog are:-

- ▶ Molecular biology kits
- ▶ Probes
- ▶ In situ hybridization
- ▶ Comprehensive technical appendices
- ▶ Vectors
- ▶ Genes
- ▶ Custom services

For your free copy of the new R&D Systems molecular biology products catalog call us today.

FOR RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC OR THERAPEUTIC PROCEDURES.

USA and Canada
R&D Systems, Inc.
614 McKinley Place NE
Minneapolis MN 55413, USA.
Tel: 1-800-343-7475
Fax: 612 379-6580

Europe
R&D Systems Europe Ltd.
4-10 The Quadrant, Barton Lane
Abingdon, OX14 3YS, UK.
Tel: +44 (0)1235 531074
Fax: +44 (0)1235 533420

Japan
Cosmo Bio Co., Ltd.
Toyo Ekimae Bldg.
2-2-20 Toyo Koto-Ku, Tokyo 135.
Tel: (03) 5632-9600
Fax: (03) 5632-9613

International Freephone Numbers
België: 078 11 04 68. Danmark: 80 01 85 92.
Deutschland: 0130 11 01 69.
France: 05 90 72 49.
Nederland: 060 225607. Norge: 800 11033.
Sverige: 020 79 31 49.

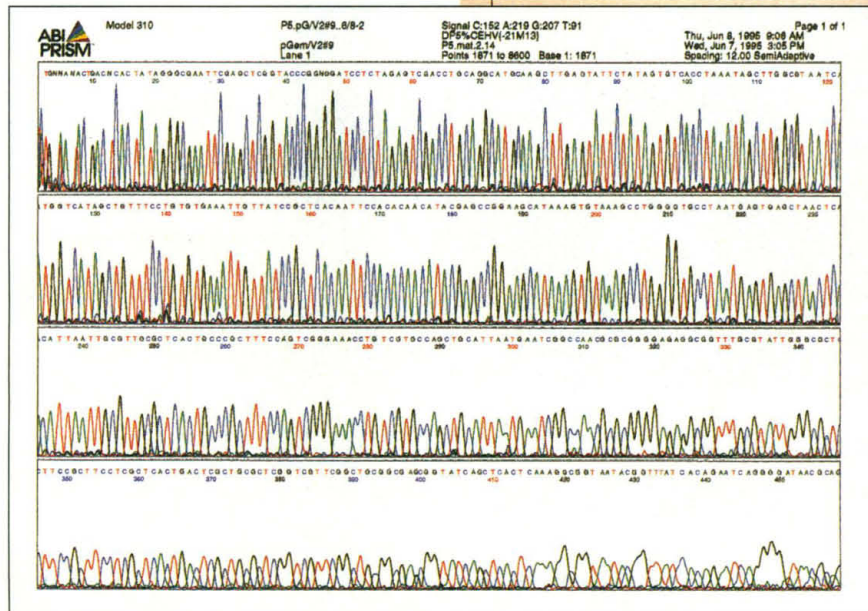
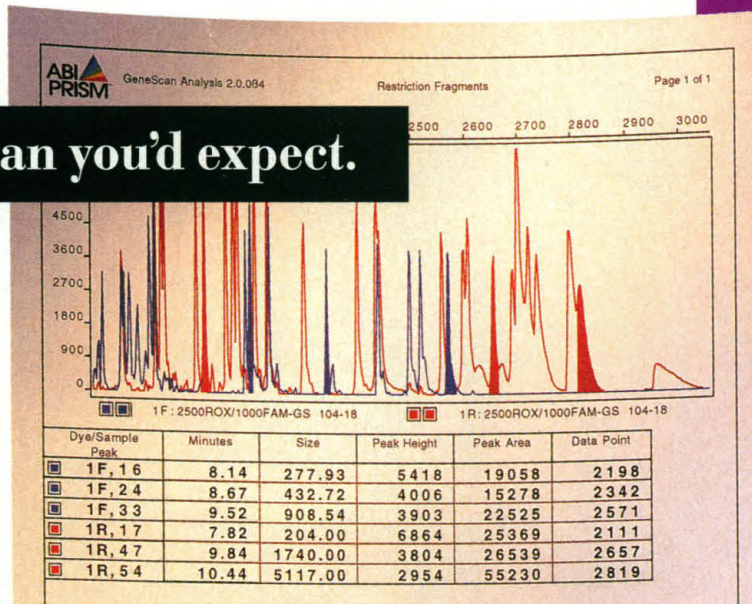
International Distributors
Argentina: (54) 1-942-3654. Austria: (43) 1 292 35 27. China: (86) 2-368-3600. Colombia: (1) 305-389-7085.
Hong Kong: (852) 649-9988. Israel: +(972) 3 9230048. Italy: (39) 2 25 75 377. Korea: (82) 2-569-0781. Mexico: (52) 5-652-3784.
Spain & Portugal: (34) 1 594 08 06 or 3 456 97 06. Venezuela: (58) 2-237-0780.



1-800-343-7475

NEW ABI PRISM™ 310 GENETIC ANALYZER

A whole lot more than you'd expect.



Run

Not For Use In Diagnostic Procedures



The new ABI PRISM™ 310 Genetic Analyzer is changing a lot of expectations about automated genetic analysis.

To begin with, it gives you a lot more versatility. The 310 system automates all the applications you now perform on acrylamide or agarose—and a whole lot more—without limitations.

At the same time, the 310 Genetic Analyzer makes genetic analysis a lot less work. You'll never have to pour

another slab gel. Instead of conventional gels, the 310 system uses revolutionary new polymers that are injected into a capillary before each run. Not only do these polymers make automation possi-

ble, their uniform consistency eliminates guesswork and helps to ensure reproducibility.

You don't even have to pipet your samples into the gel. Just perform your

ABI PRISM 310 GENETIC ANALYZER

Application	Performance
Cycle Sequencing	425 nt, 98.5% base calling accuracy
Microsatellites	2 nt resolution, 0.5% sizing precision
SSCP	0.5% pattern matching precision
Quantitation RT-PCR	4.0% peak height precision

A lot more, for a lot less. You can automate virtually any DNA electrophoresis application on the ABI PRISM 310 system. Here are just a few examples.



DNA Sequencing
Heterozygote Detection
SSCP Analysis
Microsatellite Analysis
Long PCR
RT-PCR



For a whole lot less than you'd think.



reactions, and place your labeled samples in the sample tray. The 310 system automatically injects your samples in whatever order you specify. You can even add samples during a run.

Sample preparation is a lot less trouble, too. ABI PRISM kits for fluorescent PCR and DNA sequencing reduce pipetting steps and variability. And there's no radioactivity or ethidium bromide.

Most importantly, the 310 Genetic Analyzer makes it a whole lot easier to

get the results you want. In fact, the results are so accurate, you can transfer data directly to specialized programs for genotyping, mutation detection, and sequence assembly.

But if you expect the 310 Genetic Analyzer to cost a lot, you'll be surprised to find the price is well within the budget of individual laboratories. The ABI PRISM 310 system costs about half as much as the ABI PRISM 377 system, our high-throughput DNA sequencing system.
Circle No. 25 on Readers' Service Card

The ABI PRISM 310 Genetic Analyzer. A whole lot more, for a whole lot less. To request information, call 1-800-345-5224. Outside the U.S. and Canada, contact your local Perkin-Elmer representative.

PERKIN ELMER

Europe Langen, Germany Tel: 49 6103 708 301 Fax: 49 6103 708 310
Japan Tokyo, Japan Tel: (0473) 80-8500 Fax: (0473) 80-8505
Latin America Mexico City, Mexico Tel: 52-5-651-7077 Fax: 52-5-593-6223
Australia Melbourne, Australia Tel: (03) 9212-8585 Fax: (03) 9212-8502

The Polymerase Chain Reaction (PCR) process is covered by U.S. patents owned by Hoffmann-La Roche, Inc. and Hoffmann-La Roche Ltd. Perkin-Elmer is a registered trademark and ABI PRISM is a trademark of The Perkin-Elmer Corporation.



1112
Pressures on populations



MARK O'DONOGHUE

NEWS

- FDA: Congress Mixes Harsh Medicine 1038
The Science of Regulation 1039
- 525 Laid Off As USGS Looks Ahead 1041
- Polymer Light-Emitters Gain  1042
New Life
- New Study Provides Some Good  1043
News for Fisheries
- Researchers Air Alternative Views on 1044
How HIV Kills Cells
- Ecologists Flock to Snowbird for 1045
Varied Banquet of Findings




SPECIAL NEWS REPORT

- Gene Therapy's Growing Pains 1050
Jury Still Out on Pioneering Treatment 1051
The Trouble With Vectors 1052
RAC's Identity Crisis 1054

POLICY FORUM

- Energy Needs in Developing Countries 1058
and Sustainability
J. Goldemberg

PERSPECTIVES

- Branching Out into New Polymer  1060
Markets
J. M. DeSimone
- Snowshoe Hare Populations:  1061
Squeezed from Below and Above
N. C. Stenseth
- Structure of Cytochrome c Oxidase,  1063
Energy Generator of Aerobic Life
R. Gennis and S. Ferguson-Miller

ARTICLE

- Homogeneous Catalysis in Supercritical 1065
Fluids
P. G. Jessop, T. Ikariya, R. Noyori

DEPARTMENTS

- | | |
|---|--|
| THIS WEEK IN SCIENCE 1025 | SCIENCESCOPE 1037 |
| EDITORIAL 1027
Plant Pathogens in Soils | RANDOM SAMPLES 1047
Another Bose-Einstein Condensate • Gene Hack-
ing • No Hostile Climate Found for Minorities •
India's Ph.D. • PETA on the Move • Old
World Tree Found in Colombia • Japan's Prizes •
Who's Postdocing Now? |
| LETTERS 1029
The Devi Case and More: M. M. Gottesman and
A. S. Levine; S. J. N. Devi; W. W. Stewart and N.
Feder; J. B. Robbins, R. Schneerson, J. E. Bennett;
P. R. Williamson; J. E. Rosen; C. W. McCutchen;
B. Mackey; V. Young-Horvath; J. J. Schlesselman;
M. Wilchek; E. Marshall; T. W. Mak; M. A. Navia;
J. C. Bailar III; G. B. Barnes; C. Djerassi; C.
Dingwall; T. Goldfarb, R. Crease, L. Zaikowski, L.
Paldy; S. Berget • The Johns Hopkins Institutions:
D. Nathans, J. A. Block, M. M. E. Johns • Genes
and Grocery Stores: T. D. Johnston • Source of
Comets: P. R. Weissman | BOOK REVIEWS 1121
<i>The Molecular Biology of Cyanobacteria</i> , reviewed by
R. Haselkorn • <i>Edwin Hubble: The Discoverer of the
Big Bang Universe</i> and <i>Edwin Hubble: Mariner of the
Nebulae</i> , J. Lankford • Vignettes • Books Received
• Publishers' Addresses |
| | INSIDE AAAS 1125 |
| | PRODUCTS & MATERIALS 1127 |

Board of Reviewing Editors

Frederick W. Alt
Don L. Anderson
Michael Ashburner
Stephen J. Benkovic
Alan Bernstein
David E. Bloom
Piet Borst
Henry R. Bourne
Michael S. Brown
James J. Bull

Kathryn Calame
C. Thomas Caskey
Dennis W. Choi
David Clapham
John M. Coffin
F. Fleming Crim
Paul J. Crutzen
James E. Dahlberg
Robert Desimone
Paul T. Englund

Richard G. Fairbanks
Douglas T. Fearon
Harry A. Fozzard
Klaus Friedrich
Theodore H. Geballe
Roger I. M. Glass
Stephen P. Goff
Peter N. Goodfellow
Corey S. Goodman
Ira Herskowitz

Tomas Hökfelt
Eric F. Johnson
Stephen M. Kosslyn
Michael LaBarbera
Nicole Le Douarin
Charles S. LeVings III
Alexander Levitzki
Harvey F. Lodish
Richard Losick
Reinhard Lührmann

Diane Mathis
Anthony R. Means
Shigetada Nakanishi
Roger A. Nicoll
Stuart L. Pimm
Yeshayau Pocker
Dennis A. Powers
Ralph S. Quatrano
Martin Raff
V. Ramanathan

Douglas C. Rees
T. M. Rice
David C. Rubie
Erkki Ruoslahti
Gottfried Schatz
Jozef Schell
Ronald H. Schwartz
Terrence J. Sejnowski
Ellen Solomon
Thomas A. Steitz

Michael P. Stryker
Robert T. N. Tjian
Emil R. Unanue
Geerat J. Vermeij
Bert Vogelstein
Arthur Weiss
Zena Werb
George M. Whitesides
Owen N. Witte
William A. Wulf

Crystal structure showing active site of oxidized bovine heart cytochrome c oxidase at a resolution of 2.8 angstroms. A heme (pink and red) with a copper atom (light blue) nearby is the oxygen binding and reduction site to which electrons are supplied from the other

heme and a dinuclear copper center, located 12 and 22 angstroms away, respectively. A magnesium atom (yellow) with a water oxygen (orange) is at the interface between subunits I (green) and II (white). See page 1069 and the related Perspective on page 1063.



RESEARCH ARTICLE

- Structures of Metal Sites of Oxidized Bovine Heart Cytochrome c Oxidase at 2.8 Å** 1069
T. Tsukihara, H. Aoyama, E. Yamashita, T. Tomizaki, H. Yamaguchi, K. Shinzawa-Ittoh, R. Nakashima, R. Yaono, S. Yoshikawa

REPORTS

- Deimos: An Obstacle to the Solar Wind** 1075
K. Sauer, E. Dubinin, K. Baumgärtel, A. Bogdanov

- Photodeposition of Micrometer-Scale Polymer Patterns on Optical Imaging Fibers** 1078
B. G. Healey, S. E. Foran, D. R. Walt

- Self-Condensing Vinyl Polymerization: An Approach to Dendritic Materials** 1080
J. M. J. Fréchet, M. Henmi, I. Gitsov, S. Aoshima, M. R. Leduc, R. B. Grubbs

- Scanning Interferometric Apertureless Microscopy: Optical Imaging at 10 Angstrom Resolution** 1083
F. Zenhausern, Y. Martin, H. K. Wickramasinghe

- Polymer Light-Emitting Electrochemical Cells** 1086
Q. Pei, G. Yu, C. Zhang, Y. Yang, A. J. Heeger

- Sprites, ELF Transients, and Positive Ground Strokes** 1088
D. J. Boccippio, E. R. Williams, S. J. Heckman, W. A. Lyons, I. T. Baker, R. Boldi

- The Effect of Magmatic Activity on Hydrothermal Venting Along the Superfast-Spreading East Pacific Rise** 1092
T. Urabe, E. T. Baker, J. Ishibashi, R. A. Feely, K. Marumo, G. J. Massoth, A. Maruyama, K. Shitashima, K. Okamura, J. E. Lupton, A. Sonoda, T. Yamazaki, M. Aoki, J. Gendron, R.

- Greene, Y. Kaiho, K. Kisimoto, G. Lebon, T. Matsumoto, K. Nakamura, A. Nishizawa, O. Okano, G. Paradis, K. Roe, T. Shibata, D. Tennant, T. Vance, S. L. Walker, T. Yabuki, N. Ytow

- Catalysis of the Olivine to Spinel Transformation by High Clinoenstatite** 1095
T. G. Sharp and D. C. Rubie

- A Large Northern Hemisphere Terrestrial CO₂ Sink Indicated by the ¹³C/¹²C Ratio of Atmospheric CO₂** 1098
P. Ciais, P. P. Tans, M. Trolier, J. W. C. White, R. J. Francey

- Similarity of *sli-1*, a Regulator of Vulval Development in *C. elegans*, to the Mammalian Proto-Oncogene *c-cbl*** 1102
C. H. Yoon, J. Lee, G. D. Jongeward, P. W. Sternberg

- Population Dynamics of Exploited Fish Stocks at Low Population Levels** 1106
R. A. Myers, N. J. Barrowman, J. A. Hutchings, A. A. Rosenberg

- Impaired Energy Homeostasis in *C/EBPα* Knockout Mice** 1108
N.-d. Wang, M. J. Finegold, A. Bradley, C. N. Ou, S. V. Abdelsayed, M. D. Wilde, L. R. Taylor, D. R. Wilson, G. J. Darlington

- Impact of Food and Predation on the Snowshoe Hare Cycle** 1112
C. J. Krebs, S. Boutin, R. Boonstra, A. R. E. Sinclair, J. N. M. Smith, M. R. T. Dale, K. Martin, R. Turkington

- Double Dissociation of Conditioning and Declarative Knowledge Relative to the Amygdala and Hippocampus in Humans** 1115
A. Bechara, D. Tranel, H. Damasio, R. Adolphs, C. Rockland, A. R. Damasio

1092
Pinpointing Pacific plumes

AAAS Board of Directors

Francisco J. Ayala
Retiring President,
Chairman
Rita R. Colwell
President
Jane Lubchenco
President-elect

William A. Lester Jr.
Simon A. Levin
Michael J. Novacek

Anna C. Roosevelt
Alan Schriesheim
Jean E. Taylor
Chang-Lin Tien
Nancy S. Wexler

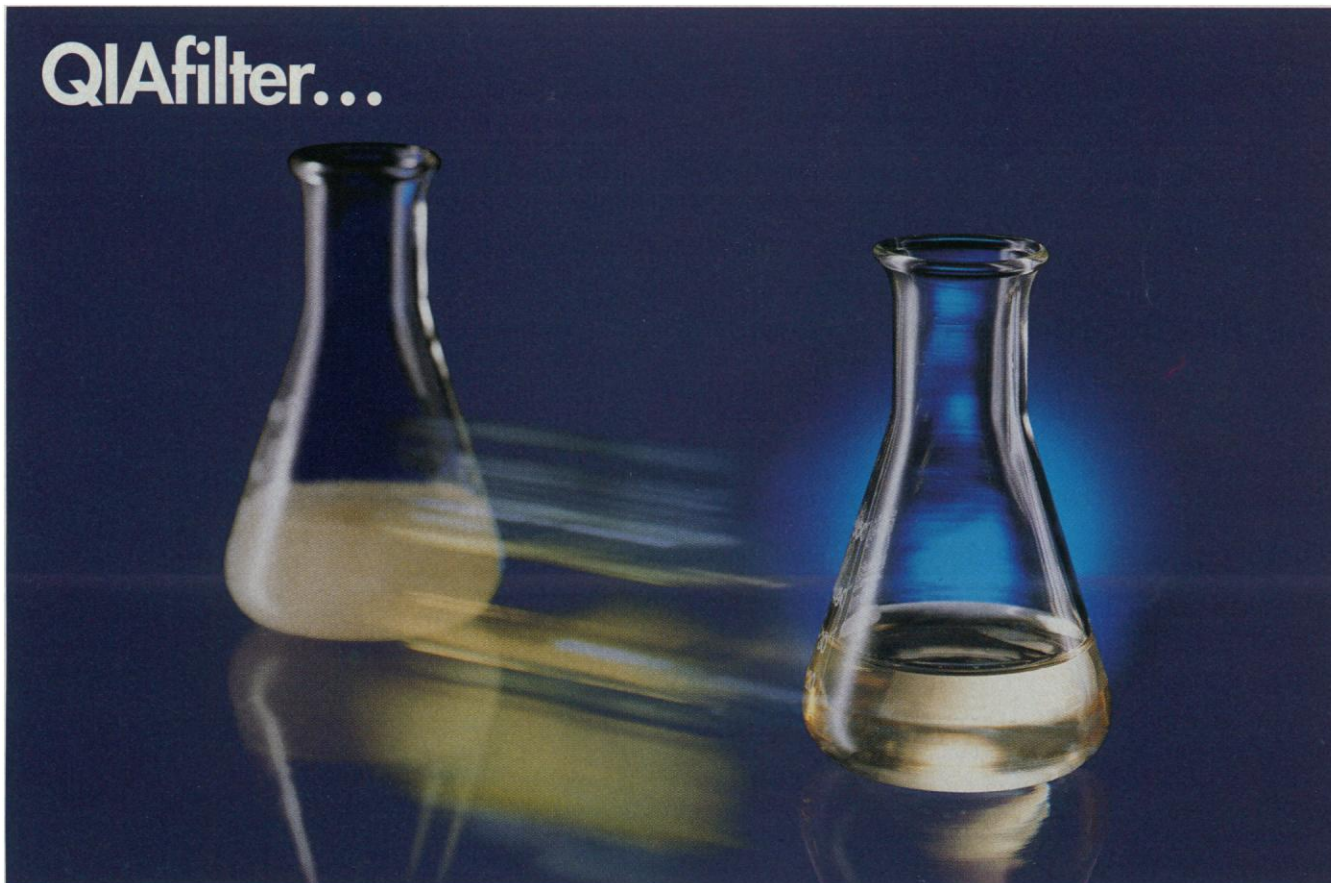
William T. Golden
Treasurer
Richard S. Nicholson
Executive Officer

■ **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 © 1995 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): \$97 (\$50 allocated to subscription). Domestic institutional subscription (51 issues): \$228. Foreign postage extra: Mexico, Caribbean (surface mail) \$53; other countries (air assist delivery) \$93. First class, airmail, student and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. Printed in the U.S.A.

■ Indicates accompanying feature

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, Marion, OH 43305-2033. **Single copy sales:** \$7.00 per issue prepaid includes surface postage; 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 \$3.00 per article is paid directly to CCC, 27 Congress Street, Salem, MA 01970. The identification code for *Science* is 0036-8075/83 \$3.00. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

QIAfilter...



...Clear Bacterial Lysates in Seconds

QIAfilter™ cartridge speeds up plasmid purification by rapidly clearing bacterial lysates without centrifugation. QIAfilter is ideal for use with QIAGEN Plasmid Midi and Maxi Kits.

The QIAfilter Advantages

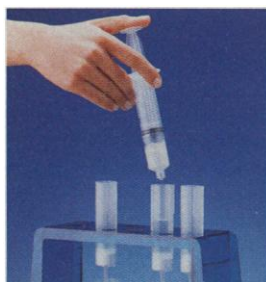
- Clears neutralized bacterial lysates in seconds
- Saves up to 1 hour of purification time
- Completely removes SDS precipitates

Clear Lysates in Seconds by passage through the specially designed QIAfilter cartridge. Cell debris and small-sized SDS precipitates which remain after conventional centrifugation are completely removed by the QIAfilter process. This makes lysates flow faster, speeding up plasmid purification even more.

QIAfilter plus QIAGEN-tips — the Perfect Combination for high, reproducible yields of ultrapure plasmid DNA.

Achieve the purity and biological activity you expect from two rounds of CsCl gradient centrifugation, in just a fraction of the time and effort.

QIAfilter cartridges are included in the QIAGEN/Filter Plasmid Midi and QIAGEN/Filter Plasmid Maxi Kits. QIAfilter Midi and QIAfilter Maxi cartridges are also available separately in packs of 25.



Order a QIAGEN/Filter Plasmid Kit today, and see how QIAfilter cartridges can speed you on your way to ultrapure plasmid DNA.

QIAfilter...

...The Second Revolution in Plasmid Purification

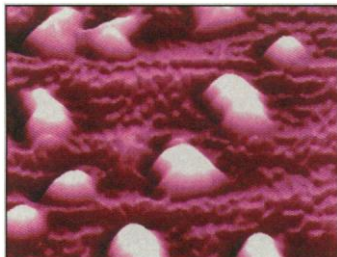
QIAGEN GmbH: Max-Valmer-Straße 4, 40724 Hilden, Germany, Orders (0)2103-892-230, Fax (0)2103-892-222, Technical Service (0)2103-892-240
QIAGEN Inc.: 9600 De Soto Avenue, Chatsworth, CA 91311, USA, Orders 800-426-8157, Fax 800-718-2056, Technical Service 800-DNA-PREP (800-362-7737)
QIAGEN Ltd.: Unit 1, Tillingbourne Ct., Dorking Business Park, Dorking, Surrey RH4 1HJ, UK, Orders (01306) 740 444, Fax (01306) 875 885, Technical Service (01306) 740 325
QIAGEN AG: Auf dem Wolf 4, 4052 Basel, Switzerland, Orders (0) 61 317 9420, Fax (0) 61 317 9422, Technical Service (0) 61 317 9420

DISTRIBUTORS: **AUSTRALIA:** BRESATEC Ltd. (08)-234 2644 **AUSTRIA:** BIO-TRADE (1)-889 18 19 **BELGIUM / LUXEMBOURG:** Westburg b.v. 0800-1-9815 (toll free)
CZECH REPUBLIC: BIO-CONSULT (02) 49 53 77 **DENMARK:** Struers KEBO Lab A/S (43)-86 87 88 **FINLAND:** KEBO Lab Oy (0)-804 551 **FRANCE:** Cogter (1)-45-32-35-17
GREECE: BIOANALYTICA S.A. (01)-6436138 **INDIA:** Genetix: (11)-546 7637 **ISRAEL:** BIO-LAB Laboratories Ltd. (02)-6524447 **ITALY:** Genenco (M-Medical srl) (055) 5001871
JAPAN: FUNAKOSHI Co., Ltd. (03)-5684-1620 **KOREA:** URS Laboratories, Inc. (02) 924-8697 **THE NETHERLANDS:** Westburg b.v. (033)-495 00 94 **NORWAY:** KEBO Lab AS (47)-22 90 00 00 **PORTUGAL:** IZASA PORTUGAL, LDA. (1)-7570740 **RSA:** WHITEHEAD SCIENTIFIC SUPPLIES (021) 981 1560 **SINGAPORE:** Research Biolabs Pte Ltd (65) 445 7927 **SPAIN:** IZASA S.A. (91)-663-05-00 **SWEDEN:** KEBO Lab (08) 621 34 00 **TAIWAN:** Formo Industrial Co., Ltd. (02)-736-7125



Apertureless imaging

Near-field scanning optical microscopy can achieve a spatial resolution of about 50 nanometers by imaging with a light source defined by a small aper-



ture. Zenhausern *et al.* (p. 1083) report a resolution of 1 nanometer obtained by interferometric detection of light scattered from a small vibrating reflective tip. The tip dimensions define the source, and the contrast mechanism involves dipole-dipole coupling between the tip and the sample. Theory suggests that atomic resolution may be possible.

Where CO₂ goes

Analysis of global warming is complicated by uncertainties about the sources and sinks for CO₂. Ciais *et al.* (p. 1098) present data for an extended range of worldwide sites and show that a large terrestrial sink existed in the Northern Hemisphere during 1992 and 1993. This sink may be natural or anthropogenic. As carbon storage on land is much more vulnerable to perturbations than oceanic storage, this partitioning of CO₂ uptake between land and oceans may have serious implications for future increases in atmospheric CO₂.

Easier to turn on

Polymer light-emitting diodes (LEDs) offer several advantages over inorganic materials, but have limitations such as short

Making sense of our senses

How do humans integrate various sensory stimuli and integrate them with our emotional state? From a study of three patients with lesions of the amygdala or the hippocampus or both, Bechara *et al.* (p. 1115) conclude that the amygdala is necessary for coupling external events to emotional response and that the hippocampus is essential for establishing factual relations between these events. Patients were conditioned to expect an unpleasantly loud horn in response to only one of several colored slides. Damage to the amygdala abolished the autonomic response to the horn without disturbing the patient's awareness of the events, while damage to the hippocampus yielded the converse.

lifetimes. Pei *et al.* (p. 1086; see the news story by Service, p. 1042) used electrochemistry to produce light emission by doping *p*- and *n*-type layers on opposite sides of a thin film of conjugated polymer. Various colors can be produced with turn-on voltages near the band gap of the emissive material. The LEDs have longer lifetimes and are less sensitive to film thickness variations.

Branch route

Highly branched polymers called dendrimers could find a number of possible applications, but the need for several rounds of synthesis have made them relatively expensive. Fréchet *et al.* (p. 1080; see the Perspective by DeSimone, p. 1060) activated a vinyl monomer to form multiple growing chains, producing irregular, highly branched polymers in one step.

Hot water heaters

Hydrothermal interaction of seawater with ocean crust are greatly affected by activity associated with the superfast spreading East Pacific Rise. Although ocean-basin-scale plumes of helium-3-rich waters emanate from this ridge, the detailed dis-

tribution of hydrothermal activity has not emerged. A survey over a large part of this ridge by Urabe *et al.* (p. 1092) identified hydrothermal plumes over 60 percent of the ridge crest surveyed, particularly above axial magma chambers.

Growing pains

How can developing countries increase their standard of living while controlling energy use and environmental degradation? In a Policy Forum, Goldemberg (p. 1058) concludes that increased energy efficiency will not meet the growing demand for energy in developing countries. Economic development will require a balance between the use of new energy sources and some environmental damage.

Population puzzles

Animal species may exhibit cyclic population levels or may show sudden drops in population; two reports present experimental and theoretical approaches to understanding these changes. Krebs *et al.* (p. 1112; see the Perspective by Stenseth, p. 1061) manipulated the food supply and predator numbers for a population of snowshoe hares and conclude that the 10-year

cycles in hare population results from a three-trophic-level interaction of food, hares, and predators. Fish populations depleted by overfishing may not recover because reproductive success may decrease at low populations, an effect called depensation. Myers *et al.* (p. 1106; see news story by Barinaga, p. 1043) analyzed data on 128 fish stocks and found that 3 stocks, including Pacific salmon, have experienced depensation. This model suggests that many threatened stocks might still recover if overfishing ceased.

Inside cytochrome c oxidase

Molecular oxygen is converted into water in the inner mitochondrial membrane of eukaryotes by cytochrome c oxidase. This process is coupled to adenosine triphosphate synthesis. Tsukihara *et al.* (p. 1069; see cover and the Perspective by Gennis and Ferguson-Miller, p. 1063) have crystallized this membrane protein and determined the structure of its metal-containing sites.

Energy crisis

The CCAAT/enhancer-binding protein α (C/EBP α) is a bZIP transcription factor expressed in the liver that has been proposed to regulate genes involved in energy metabolism. Wang *et al.* (p. 1108) generated mice in which the *c/ebp α* gene is deleted. The mutant mice appear indistinguishable from their littermates at birth, but they fail to store hepatic glycogen, and they die from hypoglycemia by 8 hours after birth. These mice had many defects in establishing and maintaining energy homeostasis.

FROM NEW ENGLAND BIOLABS...

PHOSPHO~SPECIFIC ANTIBODIES

For MAP and cdc2 Kinase



A New Line of Research Tools for Growth Factor Signaling and Cell Cycle Research

New England Biolabs offers over 20 years of dedication to research, highest quality products and responsive customer service. Now, NEB introduces the first of many antibody-based systems designed to distinguish the active state of specific molecules.

PhosphoPlus™ Antibody Kits

MAP Kinase Kit Cat. No. 9100
cdc2 (Tyr15) Kinase Kit Cat. No. 9110

Activation state-specific antibodies for:

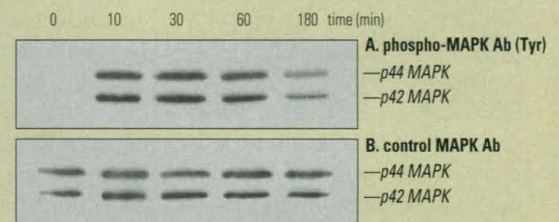
- Rapid analysis of activity within intracellular signaling pathways
- Determination of site-specific phosphorylation
- Phospho-analysis in tissue and whole cells
- Fewer problems with dephosphorylation by western analysis

Kit contains everything you need to assay phosphorylation status, including:

- Phospho- and nonphospho-antibodies and protein controls
- Phototope™ Western Detection System

Rapid Analysis of Phospho-MAP Kinase...

PC12 CELLS (NGF 100ng/ml)



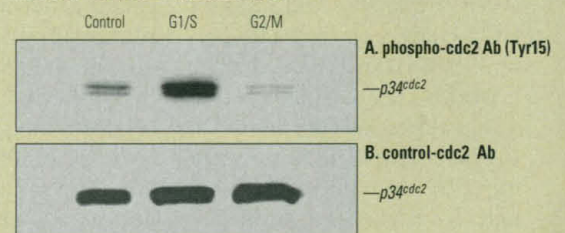
Western Blotting: Quick and easy detection of MAP kinase activation (on Tyr) from SDS-lysates of total PC12 cell extracts using **A.** phospho- and **B.** control-MAP kinase antibodies.

NIH 3T3 CELLS/PHOSPHO-MAPK Ab



Immunohistochemistry: Phospho-antibody allows *in situ*-detection and subcellular resolution of Epidermal Growth Factor (EGF)-induced MAP kinase activation and nuclear translocation.

And cdc2 Kinase



Western Blotting of cell extracts from Soac cells treated with Hydroxyurea (G1/S) or Nocodizate (G2/M) with **A.** phospho- cdc2 (Tyr15) **B.** control cdc2 antibody.

For more information on Phospho-Specific Antibodies, call 1-800-NEB-LABS or via the internet: <info@neb.com> NEB home page: <http://www.neb.com>

- New England Biolabs Inc. 32 Tozer Road, Beverly, MA 01915 USA 1-800-NEB-LABS Tel. (508) 927-5054 Fax (508) 921-1350 email: info@neb.com
- New England Biolabs Ltd., Canada Tel. (800) 387-1095 (905) 672-3370 Fax (905) 672-3414 email: info@ca.neb.com
- New England Biolabs GmbH, Federal Republic of Germany Tel. (0130) 83 30 31 (06196) 3031 Fax (06196) 83639 email: info@de.neb.com
- New England Biolabs (UK) Ltd. Tel. (0800) 31 84 86 (01462) 420616 Fax (01462) 421057 email: info@uk.neb.com

DISTRIBUTORS: Australia (075) 94-0299; Belgium (0800) 1 9815; Brazil (011) 66-3565; Denmark (31) 56 20 00; Finland (90) 420-8077; France (1) 34 60 24 24; Greece (01) 5226547; Hong Kong 649-9988; India (542) 311473; Israel (03) 5351205; Italy (02) 38103171; Japan (03) 3272-0671; Korea (02) 556-0311; Mexico (5) 519-3463; Netherlands (033) 495 00 94; New Zealand (09) 418-3039; Norway 22 22 04 11; Singapore 4457927; Sweden (08) 7348300; Switzerland (061) 481 47 13; Taiwan (02) 8802913

Circle No. 34 on Readers' Service Card

NEW ENGLAND
Biolabs®

20 years and beyond...

Filtration Problems?



The Solution Is Clear — Millipore® Filters From Techware



When it comes to filtration problems, there's no clearer solution than Millipore® Filtration Products from Sigma-Aldrich Techware.

One phone call is all it takes to gain immediate access to Millipore's comprehensive family of ready-to-use, disposable filter devices...as well as over 10,000 other brand-name laboratory equipment and supply products.

In addition to this wide selection of top quality products, Sigma-Aldrich Techware backs each purchase with

unequaled service and support, including:

- Same day shipping
- Comprehensive technical support
- Competitive pricing

So for solutions that are perfectly clear, rely on Millipore filtration products from Sigma-Aldrich Techware — your single, most convenient source for brand name laboratory supplies and equipment.

Circle the number below for your free Filtration Product Guide.



SIGMA® 
Science • Technology • Service

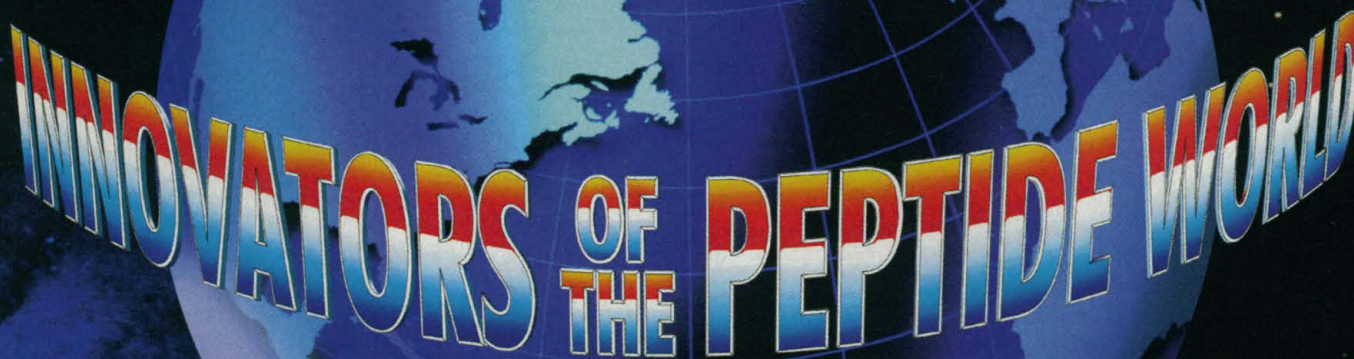
Call collect: 314-771-5750, 800-325-3010,
or contact your local Sigma office.

AUSTRALIA AUSTRIA BELGIUM BRAZIL CZECH REPUBLIC FRANCE GERMANY HUNGARY INDIA ITALY JAPAN
KOREA MEXICO NETHERLANDS POLAND SPAIN SWEDEN SWITZERLAND UNITED KINGDOM UNITED STATES

A Sigma-Aldrich Company

Circle No. 6 on Readers' Service Card

CHIRON MIMOTOPES



INNOVATORS OF THE PEPTIDE WORLD

- Custom Peptides - any quantity/purity
Large range of chemical modifications available
- Peptidomimetics - peptide/non-peptide hybrids
- PepSets™ - (low cost sets of peptides) also available biotinylated, phosphorylated, cyclised
- Polyclonal and Monoclonal Peptide Antibodies
- Antibody Screening
- Patented Peptide Combinatorial Libraries
- Analog Development Services
- Multipin™ Peptide Synthesis Kits

**CM now offers modified peptides and peptidomimetics
in our unequalled range of peptide products and services**

Your complete peptide needs are at your fingertips

North America

West Coast

Tel: 619 558 5800

Fax: 619 558 5810

Tel: 800 644 1866

Fax: 800 655 1866

East Coast

Tel: 919 571 1272

Fax: 919 510 4807

Tel: 800 633 8161

Fax: 800 424 3970

Europe

Tel: +33 72 41 7039

Fax: +33 78 37 4062

International

Tel: +61 3 9565 1111

Fax: +61 3 9565 1199



CHIRON
MIMOTOPES

Get FISH FASTER



Get Your DNA Mapped or Tissue analyzed by Fluorescent In-Situ Hybridization in a Matter of Days from Genome Systems.

Our services include;
P1 (85kb) genomic library screening service (human, ES mouse for knockouts, rat and drosophila).

New! Human PAC/BAC™ (120kb+ insert) genomic library screening service.

New! Human PAC/BAC™ and P1 high density filters.

New! YAC library screening service (human, mouse).

New! Go Germlinesm ES and MEF cells for making mouse knockouts.

New! Custom robotic colony picking and spotting services.

New! "Down To The Well"™ PCR¹able DNA pools.

Other P1 or PAC/BAC™ services include:

- DNA Preparation
- DNA Insert End Sequencing
- DNA Insert Orientation
- DNA Subcloning

GenomeSystemsInc™

8620 Pennell Drive
St. Louis, Missouri 63114, USA

800 - 430 - 0030 or, 314 - 692 - 0033
Facsimile: 314 - 692 - 0044

France: Appel gratuit, 0590 - 2104

Germany: Rufen sie uns an zum ortstarif, 0130 - 81 - 9081

UK: Call us free on, 0800 - 89 - 3733

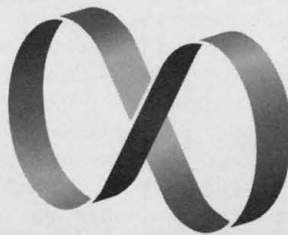
e mail address: Genome@MO.net

1. The PCR process is covered by patents owned by Hoffman-La Roche.



1996 AAAS Annual Meeting & Science Innovation Exposition

February 8-13 • Baltimore, MD • Convention Center



Where Science Comes To Life

Deadline: November 1, 1995

Present your poster paper at the
1996 AAAS Annual Meeting and
Science Innovation Exposition

AMSIE '96 Call For Poster Papers AMSIE '96

General Guidelines

Accepted posters will be assigned a 4'x 8' space. Authors will be required to be present for a designated 2-hour period. Posters may be presented in one of five (see categories below) poster sessions at AMSIE'96. An individual may be senior author on only one poster in a session and may present only one poster per day.

Categories for Poster Sessions At AMSIE'96

Science Innovation — Focuses on new and emerging technologies and methodologies for research in molecular biology, physiology, computer science and medicine. Topics include (but not limited to) molecular genetics, the genome, molecular sequencing, clinical applications of immunology, tissue engineering, gene therapy, networks and complex systems, optics, microscopy, imaging, cardiology, neurobiology, single atom technologies, and structural biology.

Life and Physical Sciences — Encompasses life science (including medicine, environment, physiology, biology, etc.); physical science (physics, mathematics, chemistry, geology, etc) and engineering or industrial science.

Social Sciences and Education — A general session that includes all areas of social science and education.

DelMarVa Region — Research activities at laboratories, universities, and colleges in the mid-Atlantic region. Submissions in all areas of science are encouraged. Students entering a poster in the Student Poster Competition may also request to present their paper in this special session.

Student Poster Competition — Recognizes the individual achievements of graduate and undergraduate students — full-time and part-time students actively working toward a college-level degree are eligible. Work presented must be the entrant's own research and not the product of a research team to which they partially contribute. Posters submitted will be divided between life sciences, physical sciences, and social sciences (including education). See Student Poster Awards for further information.

Student Poster Awards

A poster competition for research by undergraduate and graduate students. Categories include life, physical, and social sciences, and education. The most outstanding posters will be recognized with a monetary award. In addition, winners and honorable mention recipients will receive a FREE one-year (51 issues) subscription to SCIENCE. To be included in this session, type the words "Student Award Entry (Graduate or Undergraduate)" above the abstract (outside the 5" X 5" inch box). A photocopy of a current student identification card or enrollment form must be submitted with the abstract. Entries without this documentation will be ruled ineligible. To qualify individuals must be full-time or part-time students actively working toward a college-level degree.

Session Aides Needed — FREE Registration for Students

Upper division undergraduate and graduate students are eligible to serve as Session Aides for the meeting. Those who volunteer for two four-hour shifts will receive a FREE registration fee to AMSIE'96, and those who volunteer for four four-hour shifts will receive a FREE registration fee and a FREE one-year subscription to SCIENCE. For further information and application forms contact: "Session Aide Coordinator" at the address indicated.

How to Submit Poster Abstracts

Deadline: All abstracts must be received by November 1, 1995.

Endorsement: All abstracts MUST be endorsed by a member of AAAS. Members may endorse their own abstracts. All individual SCIENCE subscribers are members of AAAS. Librarians or employees of institutions holding subscriptions to SCIENCE are ineligible.

Abstract Submission Forms: To obtain an abstract form contact: "AMSIE'96 Abstract Form" at the address indicated.

How to Format Abstracts: All abstracts must fit within a 5" x 5" square in the center of an 8.5" x 11" sheet of white paper. At the top of the sheet and outside of the abstract box, type the appropriate category name. Use a typewriter or letter-quality printer with type no smaller than 10 points (12 characters per inch). Do not double-space text. After the title, list the presenting author's name and address first, then list any co-author(s) name(s) and affiliation(s). Below and to the left of the abstract (outside the box), type the presenter's name, mailing address, and phone and fax numbers. Below and to the right of the square, type the name, institution, and complete membership number (from SCIENCE mailing label) of the endorsing AAAS member along with their signature. Abstracts that are illegible or will not reproduce suitably (e.g., facsimiles or cloth ribbon typewriters with poor ribbons) will be returned. Abstracts can be submitted via internet (see Mailing Instructions). Facsimile submissions are unacceptable. Computer display equipment, sound or projection equipment, or free-standing displays are not permitted.

Registration Requirements: All poster presenters must be registered for AMSIE'96. Authors submitting abstracts before August 1, 1995 must submit a registration form immediately upon acceptance. Authors submitting abstracts after August 1, 1995 must enclose a completed registration form, including registration fee. In the event an abstract is not accepted, the full registration fee will be refunded. Abstracts received via internet will not be processed until receipt of registration form with payment.

Mailing instructions: Mail one original plus five photocopies of the abstract flat (do not bend) to: "AMSIE'96 Contributed Papers" at the address below. Note: internet submissions must be in ascii text. Authors are responsible for text accuracy.

How to Contact AAAS

Address: AAAS, Meetings Dept., 1333 H Street NW, Washington, DC 20005

Phone: (202) 326-6450

FAX: (202) 289-4021

Internet: amsie96@aaas.org

Web Page: <http://www.aaas.org>



AMERICAN ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE

Announcing...

**NO ANNUAL FEE and a Special
9.9%[†] Annual Percentage Rate
(APR) on Cash Advances and
Balance Transfers for AAAS Members.**



Introducing the AAAS Visa® Gold card, with NO ANNUAL FEE. Many AAAS members have already discovered the benefits of the AAAS Visa Gold card. Now, through this special offer, you can join your colleagues in carrying the only credit card endorsed by the AAAS.

The American Association for the Advancement of Science is pleased to present a special introductory 9.9% APR on cash advances.* As a part of your welcome package you will receive two Premium Access Checks that you can use to pay off or pay down other credit cards and installment loans.

Extra benefits include:

- A 16.4% variable APR on purchases
- Higher lines of credit ... up to \$50,000
- 30 minute credit line increases

Now you can carry the AAAS card with these and many other unsurpassed benefits and pay no annual fee.

Call Now!

1-800-847-7378, ext. 400

Please use this priority code when calling: **NTMF**

†The Annual Percentage Rate (APR) for purchases is 16.4%, which may vary. The APR is 9.9% on cash advances through your first six statement closing dates commencing on the month after your account is opened and may vary thereafter (applies to both new and outstanding cash advance balances). The current indexed rate for cash advances is 16.4%, which may vary. The transaction fee for the purchase of wire transfers, money orders, bets, lottery tickets, and casino gaming chips is 2% of each such purchase; \$2 minimum, \$25 maximum. Transaction fee for two specifically designated Premium Access Checks® or Preferred Access Checks® will be waived. The information about the cost of the card described in this application is accurate as of 1/95. The information may have changed after that date. To find out what may have changed, call 1-800-847-7378.

*Cash advances cannot be used to pay off or pay down another MBNA® account. MBNA America® Premium Access Checks and Preferred Access Checks are federally registered service marks of MBNA America Bank, N.A. MasterCard® is a federally registered service mark of MasterCard International, Inc., used pursuant to license. Visa® is a federally registered service mark of Visa U.S.A., Inc., used pursuant to license. © 1994 MBNA America Bank, N.A.