



AMERICAN  
ASSOCIATION FOR THE  
ADVANCEMENT OF  
SCIENCE

# SCIENCE

30 JUNE 1995

\$7.00

VOL. 268 • PAGES 1817-1972





# 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.



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

Circle No. 7 on Readers' Service Card

A Sigma-Aldrich Company



# FastTrack<sup>®</sup> 2.0.

A romp in fresh powder was just the inspiration we needed to isolate the highest yield of pure mRNA.

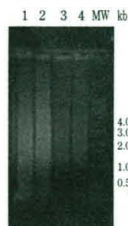


THIS POWDER is COOL STUFF.

Our latest inspiration is the most economical way to isolate the highest yield of quality mRNA every time. It's the FastTrack<sup>®</sup> 2.0 mRNA Isolation Kit from Invitrogen. The FastTrack<sup>®</sup> 2.0 Kit combines pre-measured oligo(dT) cellulose powder with a gentle, direct mRNA isolation methodology. Tests prove that no bead or magnet produces higher yields of quality mRNA than the oligo(dT) cellulose powder in the FastTrack<sup>®</sup> 2.0 Kit.

DON'T GET STUCK *with* MAGNETS.

Figure 1.



Side-by-side tests (fig. 1) show that FastTrack<sup>®</sup> 2.0 yields 2-3 times more mRNA per isolation than a magnetic bead kit costing more than twice as much. The FastTrack<sup>®</sup> Kit 2.0 includes all of the reagents, tubes, and spin columns you need. All are functionally tested and guaranteed RNase-free. Put the power of powder to work for you. Order the FastTrack<sup>®</sup> 2.0 mRNA Isolation Kit today.

mRNA isolated from  $8 \times 10^7$  HeLa cells.  
Each pellet was resuspended in 50  $\mu$ l RNase-free  $H_2O$ . 5  $\mu$ l was loaded onto a 1% agarose gel.  
Lanes 1 and 2: FastTrack<sup>®</sup> 2.0  
Lanes 3 and 4: Magnetic Beads

Catalog no. K1593-02 6 reactions  
Catalog no. K1593-03 18 reactions

**Invitrogen<sup>®</sup>**

*The Gene Expression Folks.*

**1-800-955-6288**

3985 B Sorrento Valley Boulevard  
San Diego, California 92121  
Fax orders to 619-597-6201

**EUROPEAN HEADQUARTERS:**  
**Invitrogen BV**  
De Schelp 12, 9351 NV Leek  
The Netherlands  
Tel: +31 (0) 5945 15175  
Fax: +31 (0) 5945 15312

**TOLL FREE TELEPHONE NUMBERS:**  
Belgium 078 1111 73  
Germany 0130 8100 43  
The Netherlands 06 022 8848  
Switzerland 155 1966

**Distributors:**

Austria 1 889 1819  
Australia 03 562 6888  
Denmark 80 01 85 92  
Finland 0 420 8077  
France 05 90 72 49

Hong Kong 886 2 381 0844  
Israel 02 524 447  
Italy 02 38 10 31 71  
Japan 03 5684 1616  
Korea 822 569 6902  
Norway 800 11033

Singapore 65 779 1919  
or 29 29 783  
Spain 03 450 2601  
Sweden 020 79 31 49  
Taiwan 886 2 381 0844  
UK 01235 53 10 74

Circle No. 27 on Readers' Service Card



**WE  
WANTED  
TO CALL IT  
KILLER-  
COMPLIANT  
BUTT-KICKIN'  
MEGA-OPEN  
64-BIT  
UNIX.**



DEC OSF/1® is now Digital UNIX®. But the change is in name only—it's still the most standards-compliant version of UNIX there is. The only commercial UNIX that delivers true 64-bit architecture today—assuring what the Yankee Group terms “uninterrupted

## MARKETING MADE US SHORTEN IT TO DIGITAL UNIX. price/performance leadership in UNIX systems for the

foreseeable future.” The new name signifies the award of the X/Open UNIX brand to our industry-leading product—and reflects our pledge of continued standards-compliance in the future. What's it all mean to you? It means you can now have next-generation

Alpha technology, plus the reassurance of certified openness for the future. You can

have an operating system that runs thousands upon thousands

of applications, and interoperates with just about

everything on your ever-changing network.

You can have the scalability to grow as

big as you want, as fast as you need to. You can,

**digital**™

in essence, have it all. All from a company

that's committed to full-tilt, full-featured, fully supported open systems.

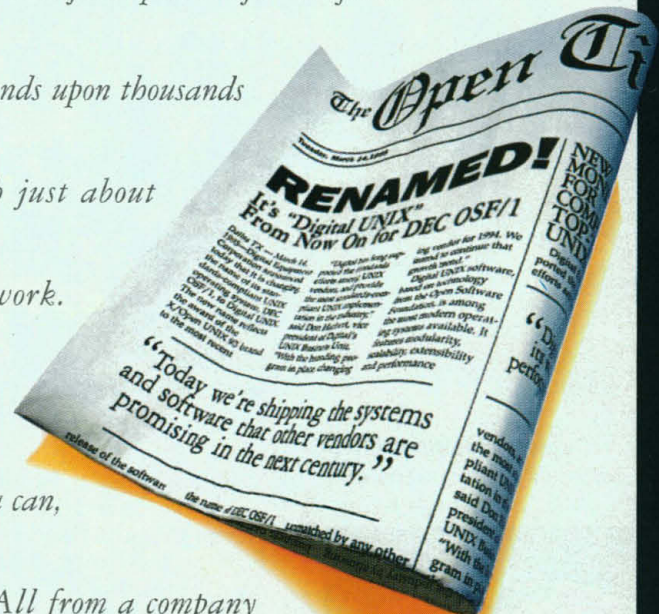
So find out more today by calling 1-800-DIGITAL. Or reach us via our Internet address:

[moreinfo@digital.com](mailto:moreinfo@digital.com). One of those clever folks in Marketing will be happy to help you.

AAC

Circle No. 53 on Readers' Service Card

©1995 Digital Equipment Corporation. Digital, the DIGITAL logo and DEC are trademarks of Digital Equipment Corporation. OSF/1 is a registered trademark of the Open Software Foundation, Inc. UNIX is a registered trademark in the United States and other countries, licensed exclusively through the X/Open Company, Ltd. The Yankee Group quote is from Yankee Watch: “Commercial UNIX: This Time We Mean Business,” May 1994. Digital UNIX V3.2 on Alpha is an X/Open UNIX93 branded product.





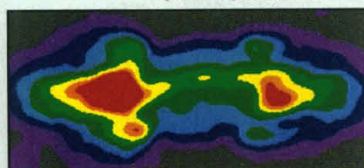


**1836**

A mountain of trouble

**1829, 1875,  
& 1879**

Comet collision excites  
microwave emissions and  
perhaps lightning



## NEWS & COMMENT

- Blowup at Yucca Mountain 1836
- Downsizing Squeezes Basic Research at the USGS 1840
- NIH's "Gay Gene" Study Questioned 1841
- House Saves, Kills, Then Saves OTA 1842
- Management Overhaul at Johns Hopkins 1842
- Italy: Funding Reform Fights On Against Researchers' Apathy 1843
- Russia: Science Law Advances Despite Criticism 1844
- The Netherlands: R&D Increase Targets Industry 1844

## RESEARCH NEWS

- New Alzheimer's Gene Found 1845
- Getting a Reaction in Close-up 1846
- Controversy: Is KS Really Caused By New Herpesvirus? 1847
- A Gentle Scheme for Unleashing Chaos 1848

- Astronomers Paint the Big Picture and Fill in the Blanks 1849

- Bacterial Virulence Genes Lead Double Life 1850

- New Finds Rekindle Debate Over Anthropoid Origins 1851

## PERSPECTIVES

- Appropriate Partners Make Good Matches 1857  
P. Karran
- The Structure of Photolyase: Using Photon Energy for DNA Repair 1858  
J. E. Hearst

## ARTICLE

- A Helical Polymer with a Cooperative Response to Chiral Information 1860  
M. M. Green, N. C. Peterson, T. Sato, A. Teramoto, R. Cook, S. Lifson

## RESEARCH ARTICLE

- Crystal Structure of DNA Photolyase from *Escherichia coli* 1866  
H.-W. Park, S.-T. Kim, A. Sancar, J. Deisenhofer

## DEPARTMENTS

- THIS WEEK IN SCIENCE** 1825
- EDITORIAL** 1827  
Biomedical Research: A Vital Investment
- LETTERS** 1829  
Jovian Lightning After Comet Impacts?: B. Vonnegut • Delaney Reform: S. M. Cohen *et al.* • Transgenic Plants: Effect on the Third World: P. K. Stumpf • Familial Polycythemia: J. T. Prchal, G. L. Semenza, J. Prchal, L. Sokol • Prebiotic 5-Substituted Uracils and a Primitive Genetic Code: S. Black; M. P. Robertson and S. L. Miller • Steroid Hormone- and Neurotransmitter-Induced Rat Sexual Behavior: Addendum: S. K. Mani, J. M. C.

- Allen, J. H. Clark, J. D. Blaustein, B. W. O'Malley
- SCIENCESCOPE** 1835
- RANDOM SAMPLES** 1853
- BOOK REVIEWS** 1927  
*The Little Dinosaurs of Ghost Ranch*, reviewed by L. F. Laporte • Other Books of Interest: *Atlas of Compact Groups of Galaxies*; *Ketenes* • Vignettes • Books Received
- INSIDE AAAS** 1931
- PRODUCTS & MATERIALS** 1934
- QUARTERLY INDEX** 1937

## Board of Reviewing Editors

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

C. Thomas Caskey  
Dennis W. Choi  
John M. Coffin  
F. Fleming Crim  
Paul J. Crutzen  
James E. Dahlberg  
Robert Desimone  
Bruce F. Eldridge  
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  
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  
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



A male gray seal issuing a threat. Colonially breeding gray seals are widely assumed to be typical polygynous mammals, with males competing for positions among groups of physically smaller, more numerous females. However, molecular genetic analysis reveals

large numbers of full siblings. Such a pattern implies that many seals mate preferentially with previous partners. See page 1897. [Photo: P. P. Pomeroy/Sea Mammal Research Unit]



## REPORTS

**Optical Switching and Image Storage by Means of Azobenzene Liquid-Crystal Films** 1873  
T. Ikeda and O. Tsutsumi

**Observation of Shoemaker-Levy Impacts by the Galileo Photopolarimeter Radiometer** 1875  
T. Z. Martin, G. S. Orton, L. D. Travis, L. K. Tamppari, I. Claypool

**Outburst of Jupiter's Synchrotron Radiation After the Impact of Comet Shoemaker-Levy 9** 1879  
I. de Pater, C. Heiles, M. Wong, R. J. Maddalena, M. K. Bird, O. Funke, J. Neidhoefer, R. M. Price, M. Kesteven, M. Calabretta, M. J. Klein, S. Gulkis, S. J. Bolton, R. S. Foster, S. Sukumar, R. G. Strom, R. S. LePoole, T. Spoelstra, M. Robison, R. W. Hunstead, D. Campbell-Wilson, T. Ye, G. Dulk, Y. Leblanc, P. Galopeau, E. Gerard, A. Lecacheux

**Observation of Individual Chemical Reactions in Solution** 1883  
M. M. Collinson and R. M. Wightman

**Skulls and Anterior Teeth of *Catopithecus* (Primates:Anthropoidea) from the Eocene Anthropoid Origins** 1885  
E. L. Simons

**A Scattered-Wave Image of Subduction Beneath the Transverse Ranges** 1888  
J. Revenaugh

**Structure and Density of FeS at High Pressure and High Temperature and the Internal Structure of Mars** 1892  
Y. Fei, C. T. Prewitt, H.-k. Mao, C. M. Bertka

**Managing the Evolution of Insect Resistance to Transgenic Plants** 1894  
D. N. Alstad and D. A. Andow

**Evidence for Mate Fidelity in the Gray Seal** 1897  
B. Amos, S. Twiss, P. Pomeroy, S. Anderson

**Common Virulence Factors for Bacterial Pathogenicity in Plants and Animals** 1899  
L. G. Rahme, E. J. Stevens, S. F. Wolfort, J. Shao, R. G. Tompkins, F. M. Ausubel

**Reversal of Raf-1 Activation by Purified and Membrane-Associated Protein Phosphatases** 1902  
P. Dent, T. Jelinek, D. K. Morrison, M. J. Weber, T. W. Sturgill

**Requirement for TNF- $\alpha$  and IL-1 $\alpha$  in Fetal Thymocyte Commitment and Differentiation** 1906  
J. C. Zúñiga-Pflücker, D. Jiang, M. J. Lenardo

**Isolation of an hMSH2-p160 Heterodimer That Restores DNA Mismatch Repair to Tumor Cells** 1909  
J. T. Drummond, G.-M. Li, M. J. Longley, P. Modrich

**GTBP, a 160-Kilodalton Protein Essential for Mismatch-Binding Activity in Human Cells** 1912  
F. Palombo, P. Gallinari, I. Iaccarino, T. Lettieri, M. Hughes, A. D'Arrigo, O. Truong, J. J. Hsuan, J. Jiricny

**Mutations of GTBP in Genetically Unstable Cells** 1915  
N. Papadopoulos, N. C. Nicolaides, B. Liu, R. Parsons, C. Lengauer, F. Palombo, A. D'Arrigo, S. Markowitz, J. K. V. Willson, K. W. Kinzler, J. Jiricny, B. Vogelstein

**Induction of Metaphase Arrest in *Drosophila* Oocytes by Chiasma-Based Kinetochore Tension** 1917  
J. K. Jang, L. Messina, M. B. Erdman, T. Arbel, R. S. Hawley

## TECHNICAL COMMENTS

**Zinc and Alzheimer's Disease** 1920  
D. J. Fitzgerald, J. E. Maggio, W. P. Esler, E. R. Stimson, J. M. Jennings, J. R. Ghilardi, P. W. Mantyh, A. I. Bush, R. D. Moir, K. M. Rosenkranz, R. E. Tanzi

# 1917

Meiotic cell cycle arrest requires tension



## 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 0036-8075/95 \$3.00. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.





# QIAexpress Protein Purification Made Simple

The QIAexpress System makes expression and purification of recombinant proteins simple. How simple? With the system, you can efficiently purify proteins:

- in just one step.
- from dilute solutions.
- from inclusion bodies.
- under native/denaturing conditions.

The system uses the strong interaction between histidine and  $\text{Ni}^{2+}$  ions for purification of recombinant proteins by metal chelate chromatography.

QIAexpress's exclusive Ni-NTA resin is specially designed to bind  $\text{Ni}^{2+}$  ions more tightly than other metal chelating resins, and brings you enhanced purification power and binding capacity.

Simply add a 6xHis tag to the N- or C-terminus of the recombinant protein sequence using the high level

Nothing could be more simple.

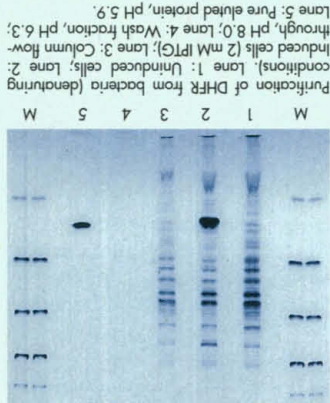
or your distributor soon and ask about QIAexpress System and Ni-NTA resin.

To find out more about how simple protein purification can be, call QIAexpress or your distributor soon and ask about QIAexpress System and Ni-NTA resin.

The latest addition to the QIAexpress system is our new **Ni-NTA Spin Kit** for protein miniprep. Use it to quickly screen clones for expression, or to purify small amounts of protein.

And QIAexpress is more than just a great way to express and purify proteins. The 6xHis tag is small, poorly immunogenic, and rarely has to be cleaved from the protein after purification.

To find out more about how simple protein purification can be, call QIAexpress or your distributor soon and ask about QIAexpress System and Ni-NTA resin.



**QIAGEN GmbH:** Max-Planck-Strasse 4, 40724 Hilden, Germany, Orders (0)2103-892-230, Fax (0)2103-892-222, Technical Service (0)2103-892-240  
**QIAGEN Ltd.:** Unit 1, Tillingsbourne Ct., Dorking Business Park, Dorking, Surrey RH4 1HT, UK, Orders (0)1306 740 444, Fax (0)1306 875 885, Technical Service (0)1306 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:** **AUSTRIA:** BRESATEC Ltd. (08) 234 2644 **AUSTRIA:** BIO-TRADE (1) 889 18 19 **BEIGIUM / LUXEMBOURG:** Westburg b.v. 0800-1-9815 ( toll free)  
**DENMARK:** Shivers KEOB Lab A/S (43) 86 87 88 **FINLAND:** KEOB Lab Oy (0) 804 551 **FRANCE:** Coges (1) 45 32 35 17 **GREECE:** BIOANALYTICA S.A. (01) 64361 38  
**INDIA:** Genies KEOB Lab A/S (43) 86 87 88 **ISRAEL:** BIO-LAB Ltd. (02) 652 447 **ITALY:** Genies (M-Medical srl) (055) 5001871 **JAPAN:** FUNAKOSHI CO. Ltd. (03) 5684 1620  
**KOREA:** LBS Laboratories, Inc. (02) 924 8697 **THE NETHERLANDS:** Westburg b.v. (033) 495 00 94 **NORWAY:** KEOB Lab AS (47) 22 90 00 00 **PORTUGAL:** IZASA PORTUGAL LDA (1) 7570740 **RSA:** WHITEHEAD SCIENTIFIC SUPPLIES (021) 981 1560 **SINGAPORE:** TIBS Trading Pte Ltd. (BioTech Branch) (65) 482 3888 **SPAIN:** IZASA S.A. (91) 663 05 00  
**SWEDEN:** KEOB Lab (08) 621 34 00 **TAIWAN:** Formo Industrial Co., Ltd. (02) 736 71 25

Circle No. 51 on Readers' Service Card





## Induced twist

Polyisocyanates are stiff polymers that adopt a helical geometry, but their chemical structure does not predispose them to either a right- or left-handed spiral. Instead, long blocks of one handedness or the other alternate at helical reversals. However, one helical sense can be strongly favored by including a small fraction of optically active monomer units or by dissolving the polymer in chiral solvents. Green *et al.* (p. 1860) discuss these results and how they bear on theoretical descriptions of helix formation.

## Light switching

Films of polymeric liquid crystals containing azobenzene groups have been used by Ikeda and Tsutsumi (p. 1873) to rapidly store and erase images. Images are formed because the trans isomer of these molecules forms a nematic liquid crystal, whereas the cis form is isotropic. Ultraviolet light isomerizes the trans molecules to the cis form and



can create images on a 200-microsecond time scale. Although the cis-trans back reaction occurs at room temperature, the polymeric material does not reorder. However, an intense infrared laser pulse can be used to heat the polymeric material and restore the nematic phase, thus erasing the image.

## Still having an impact

Two reports describe additional observations of the collision of Comet Shoemaker-Levy 9 into Jupiter. Martin *et al.* (p. 1875)

## Shedding light on DNA repair

Ultraviolet radiation in sunlight damages DNA, mainly by forming pyrimidine dimers. DNA photolyase uses blue light to split these dimers and repair the damage. Park *et al.* (p. 1866; see the Perspective by Hearst, p. 1858) present the crystal structure of DNA photolyase from *Escherichia coli*. They identify the binding sites for the two cofactors, a light-harvesting folate that absorbs the photon and which transfers its energy to a catalytic flavin, which donates an electron to the dimer and then takes it back to split the bridging ring. The binding site for the pyrimidine dimers suggests that the dimer is flipped out from the DNA helix.

used the Photopolarimeter Radiometer onboard Galileo to detect light emission directly from the initial impacts. They argue that these signals originate from the early intense phase of a hot, compact fireball. De Pater *et al.* (p. 1879) report that the microwave emission from Jupiter's magnetosphere increased dramatically during the impacts, particularly near the jovian equator, even though cometary dust was expected to degrade the signal. The observations imply that the impacts somehow altered the population of particles in the magnetosphere.

## Two at a time

Several methods have been developed recently to observe the properties of single molecules, such as their fluorescence, in order to see how individual events differ from the average values seen in conventional experiments. Chemists are interested not only in spectra but also in whether individual chemical reactions between molecules in solution can be resolved. Collinson and Wightman (p. 1883; see news story by Service, p. 1846) developed a method for observing reactions resulting from the collision of a single pair of molecules. Microelectrodes generated cation and anion radicals

of 9,10-diphenylanthracene, which recombine in a chemiluminescent reaction. The emission events, seen from a small diffusion encounter zone, follow a Poisson distribution.

## Transverse image

Accurately imaging the upper mantle is a key to understanding the origin of complex tectonic features along plate boundaries. The Transverse Ranges in southern California, which formed from the convergence of the Pacific and North American plates along a prominent bend in the San Andreas fault, are among the most studied. Revenaugh (p. 1888) imaged the upper mantle structure in this region by combining known tomography with maps of seismic P-wave scattering, which can reveal small (2 kilometers) features. The images reveal that the edge of the crust subducting beneath the southern Transverse Ranges is abrupt.

## Common strategy

Many bacterial pathogens are highly species specific, yet despite the large differences between plants and animals, some bacteria can infect both. Rahme *et al.* (p. 1899; see news story by Wuethrich, p. 1850) examined

a *Pseudomonas aeruginosa* strain that is infectious in both an *Arabidopsis thaliana* leaf infiltration model and a mouse skin burn model. Mutations in three genes reduced pathogenicity in both hosts and suggests that common virulence factors can operate in plants and animals.

## Patchwork solution

Many economically important crops have now been genetically engineered to express the crystal protein from *Bacillus thuringiensis*, which is toxic to pests such as the European corn borer, a moth that attacks maize. One approach for avoiding the development of resistance to the toxin is to plant fields of toxic and nontoxic crops next to one another, but heavy losses would be incurred in the nontoxic fields. A computer model developed by Alstad and Andow (p. 1894) that takes into account the life cycle and preferences of the European corn borer indicates that certain patchwork planting strategies, such as early planting of the toxin-expressing crop, can be more effective in reducing insect damage to the nontoxic crops needed to delay the onset of resistance.

## Pulled to a halt

The arrest of meiosis at metaphase I or II before fertilization is a common feature of oogenesis in many organisms. In *Drosophila*, arrest at metaphase II occurs only in oocytes in which at least one meiotic recombination event has occurred. Janget *et al.* (p. 1917) show that it is not the exchange event itself but the presence of tension on the kinetochore that regulates the proper progression of the meiotic cell cycle.



*NEW from Cayman Chemical...*

# Adhesion Molecule EIAs



*This Southern Stingray was photographed at Stingray City just inside the reef near Rum Point, Grand Cayman Island. We are indebted to the marine ecosystem of the Cayman Islands which provided us with the raw materials to begin Cayman Chemical over 15 years ago.*

1993 Don Wilbarger

*Although bio- and organic synthetic methods have replaced our need for these natural products, we express our appreciation for the reef ecosystem which supported our beginnings through the continuing theme of marine photography.*

**sE-Selectin**

**sL-Selectin**

**sVCAM-1**

**sICAM-1**

Cayman Chemical proudly introduces our newest line of EIAs for soluble human adhesion molecule measurement. These assays feature:

- Color coded reagents
- Total assay time of 2 hours
- Control serum for added confidence
- Reasonable price - \$425 for 96 wells

Discover the ultimate adhesion molecule assays at **Cayman Chemical** -



*The company scientists trust to meet their research needs.*

690 KMS Place • Ann Arbor, MI 48108 USA • Phone: (800) 364-9897, (313) 662-6756 • Fax: (313) 662-6896

**Cayman Chemical Worldwide:** Contact us for the name and address of your local distributor.

Australia Austria Finland France Germany Italy Japan Netherlands Norway Sweden Switzerland Taiwan United Kingdom United States  
Circle No. 29 on Readers' Service Card

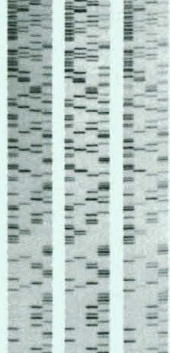


## AmpliCycle™ Sequencing Kit

You've been looking at gels like this for years.

Now get results like this in just one hour.

Starting Template Amounts  
100 fmol 5 fmol 1 fmol



DNA sequence obtained with the AmpliCycle Sequencing Kit and the GC-rich control template, pBSMB, <sup>33</sup>P end-labeled primer.

For superior sequencing results directly from any template source—PCR products, plaques, colonies, ss or dsDNA—use the AmpliCycle™ Sequencing Kit from Perkin-Elmer.

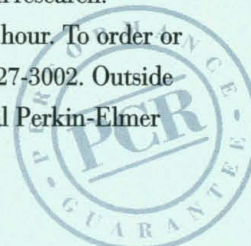
This kit features AmpliTaq® DNA Polymerase, CS, a novel enzyme specifically developed for cycle sequencing. It provides ladders with even band intensities, low background, and fewer false terminations using <sup>32</sup>P, <sup>33</sup>P, or <sup>35</sup>S.

Accurate DNA sequences can be determined with as little as one hour exposure or from as little as 1 fmol of template. By adjusting the amount of template and label, protocols can be optimized for sensitivity or isotope conservation, with end-labeling or direct incorporation.

Perkin-Elmer's performance guarantee backs every AmpliCycle Sequencing Kit. The integrated resources of our

Applied Biosystems Division offer the most comprehensive range of systems, technologies, and support in PCR, genetic analysis, nucleic acid synthesis, and protein research.

Now get sequencing results in just one hour. To order or to request more information, call 1-800-327-3002. Outside the U.S. and Canada, call or fax 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

Perkin-Elmer PCR reagents are developed and manufactured by Roche Molecular Systems, Inc., Branchburg, New Jersey, U.S.A.



Perkin-Elmer is a registered trademark of The Perkin-Elmer Corporation. AmpliCycle is a trademark and AmpliTaq is a registered trademark of Roche Molecular Systems, Inc. The GeneAmp PCR process is covered by U.S. patents owned by Hoffmann-La Roche, Inc. and F.Hoffmann-La Roche Ltd.

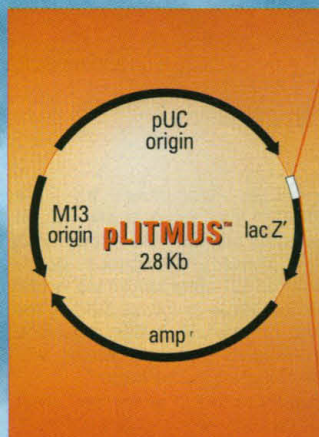
Circle No. 30 on Readers' Service Card



# LITMUS Multipurpose Cloning Vectors...



## A Cut Above the Rest.



LITMUS 28	LITMUS 29	LITMUS 38	LITMUS 39
Spe I T7 ↓	Spe I T7 ↓	Spe I T7 ↓	Spe I T7 ↓
Bgl II	Kpn I-Acc65 I	Apa I-Bsp120 I	Sal I
Nsi I-Ppu10 I	Sac I	Mfe I	Sph I
BssH II	Avr II	NgoM I	BsrG I
BsiW I	Xba I	Kas I	BspE I
Xho I	Age I	Hind III	Mlu I
EcoR I	Aat II	Pst I	Eag I
Pst I	Nco I	EcoR V	Nhe I
EcoR V	Hind III	BamH I	EcoR I
BamH I	BamH I	EcoR I	BamH I
Hind III	EcoR V	Nhe I	EcoR V
Nco I	Pst I	Eag I	Pst I
Aat II	EcoR I	Mlu I	Hind III
Age I	Xho I	BspE I	Kas I
Xba I	BsiW I	BsrG I	NgoM I
Avr II	BssH II	Sph I	Mfe I
Sac I	Nsi I-Ppu10 I	Sal I	Apa I-Bsp120 I
Kpn I-Acc65 I	Bgl II	Stu I	Stu I
Stu I	Stu I		
Afl II T7 ↑	Afl II T7 ↑	Afl II T7 ↑	Afl II T7 ↑

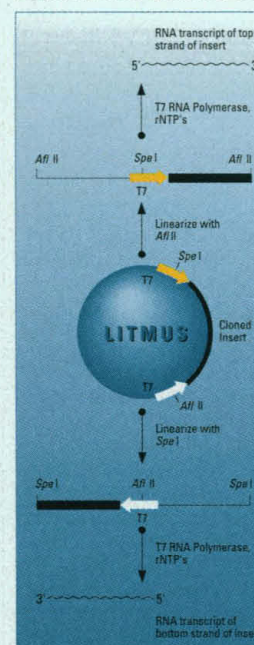
Polylinker cloning sites in LITMUS Vectors

## From New England Biolabs, Vectors for DNA Cloning...

Ideally suited for cloning, mutagenesis and *in vitro* transcription work, NEB's new LITMUS™ cloning vectors are designed for convenience, familiarity, and maximum utility.

- Extensive set of restriction sites in polylinkers – including most nondegenerate 6-base recognition sequences, spaced to permit digestion at adjacent sites.
- Blue/White screening for cloned inserts.
- Evenly-distributed 3' overhang sites for generation of unidirectional nested deletions with NEB's Exo-Size™ Deletion Kit (cat# 460) – permits sequencing of long inserts without "primer walking."
- Stable, high copy number plasmids give yields up to 4 mg/L.
- M13 replication origin – allows production of single-stranded DNA template for sequencing or *in vitro* mutagenesis.

## And RNA Probe Production.



### Simple To Optimize.

Opposing T7 promoters enable a single RNA polymerase to be used for making RNA probes in either direction for high-sensitivity Southern blots.

### Ordering Information

#306-28	20 µg	LITMUS 28
#306-29	20 µg	LITMUS 29
#306-38	20 µg	LITMUS 38
#306-39	20 µg	LITMUS 39

### Companion Products

#315	1.8 ml	M13K07 helper phage
------	--------	---------------------

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

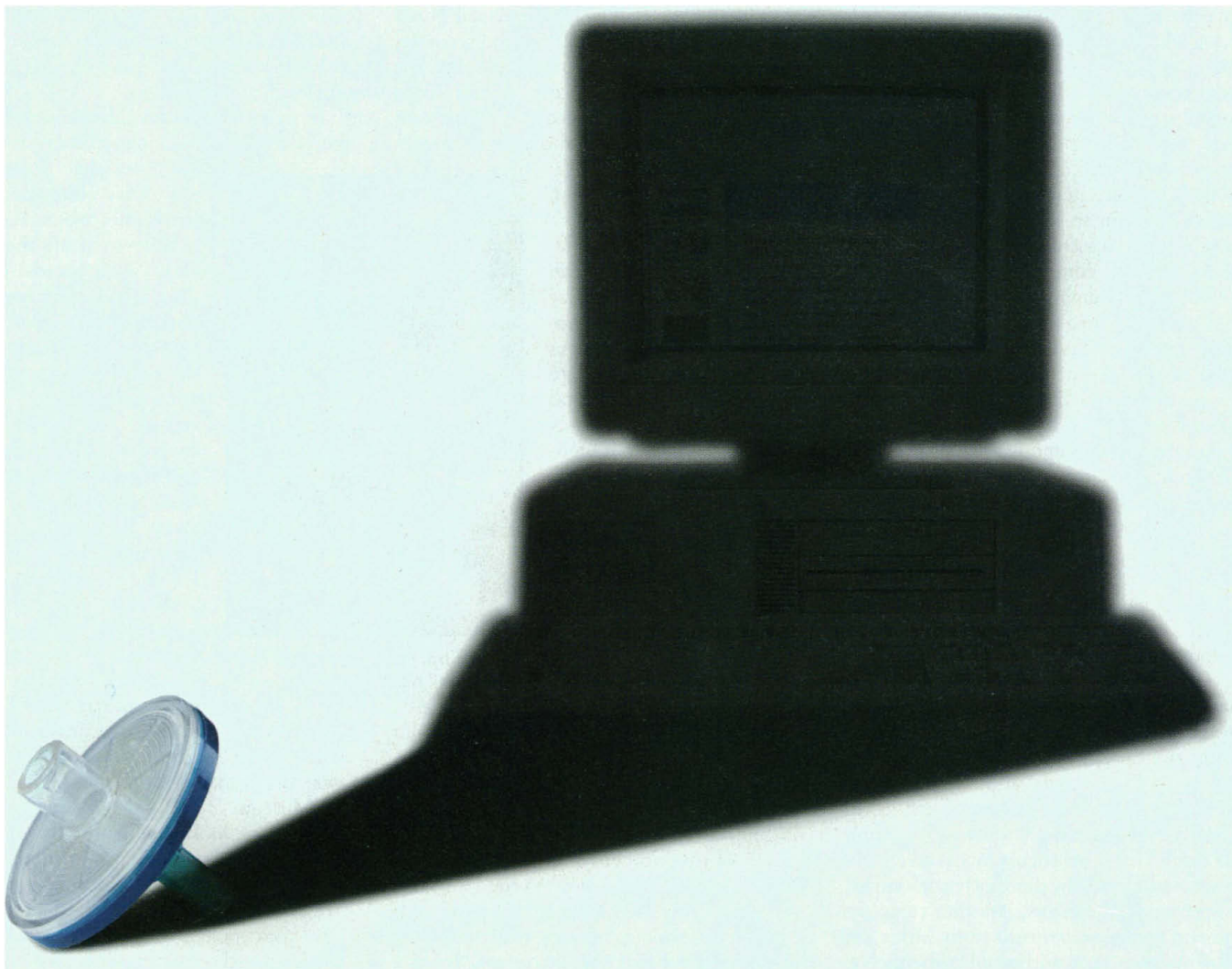
- New England Biolabs Inc. 32 Tozer Road, Beverly, MA 01915 USA 1-800-NEB-LABS Tel. (508) 927-5054 Fax (508) 921-1350 email: info@neb.com
- New England Biolabs Ltd., Canada Tel. (800) 387-1095 (905) 672-3370 Fax (905) 672-3414 email: info@ca.neb.com
- New England Biolabs GmbH, Federal Republic of Germany 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. 50 on Readers' Service Card

NEW ENGLAND  
**Biolabs®**  
20 years and beyond...





**What appears to be a simple filter is actually an on-line gateway to laboratory filtration techniques.** Looks can be deceiving. This unassuming filter actually links you to our Internet site (URL: <http://www.millipore.com>), expert phone support and volumes of research and references. For laboratory analysis help, log on or call 1-800-MILLIPORE in the U.S. In Europe, fax to +33-88.38.91.95. In Japan, call (03)3474-9111. And use the filter with more behind it.

MILLIPORE



# 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

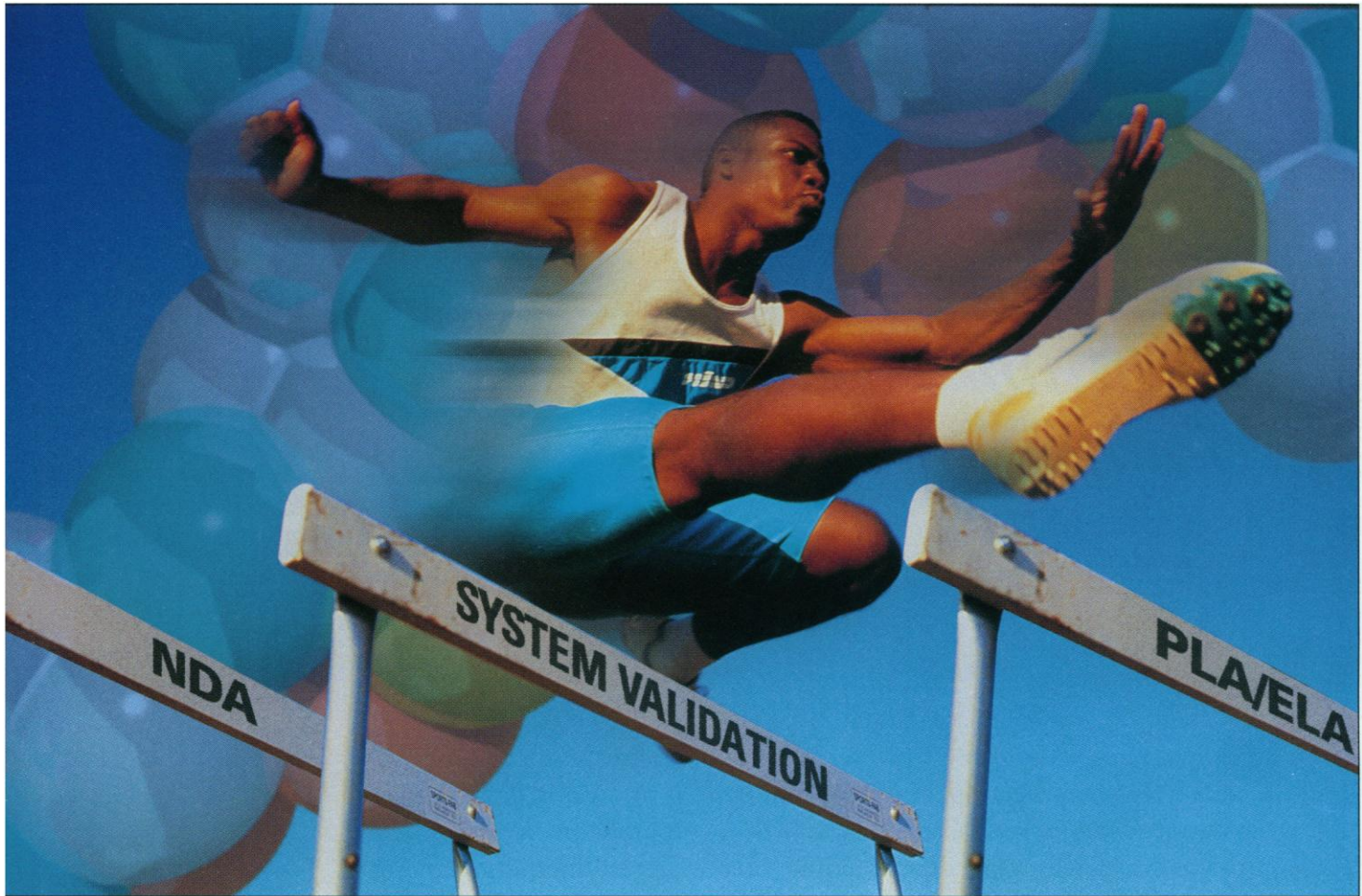
Tel: +61 3 9565 1111  
Fax: +61 3 9565 1199



**CHIRON**  
MIMOTOPES



As you reach for greater heights,  
Hewlett-Packard® keeps your feet planted  
firmly on the ground.



**Our technological superiority and a solid foundation in regulatory compliance keeps you sure-footed.**

The bioscience industry is facing significant challenges. There are reductions in funding, pressures to contain costs and regulatory requirements that are becoming increasingly complex, and more stringent than ever before. Fortunately, Hewlett-Packard's wide range of advanced systems and services for protein characterization have been specifically designed to help you meet quality demands. In fact, we offer the industry's most comprehensive

compliance program that features products and services to help you reduce costs and increase productivity in a regulated environment.

What's more, we have an expanded product offering for protein chemistry that includes our revolutionary C-terminal sequencer and MALDI-TOF. We've added API Electrospray enhancements and peptide tools software to our LC/MS. And we are offering a new generation bio UV-Visible system and multitechnique software with built-in compliance features. Plus, we've developed an extensive library of applications for all products in our protein bench. All with the same reliability and

technical performance people have come to expect from Hewlett-Packard.

For more information about how Hewlett-Packard can help you manage a complete, cost-effective compliance program, contact a representative at **1-800-334-3110**, ext. 1158. Because your time should be spent interpreting scientific data, not regulations.

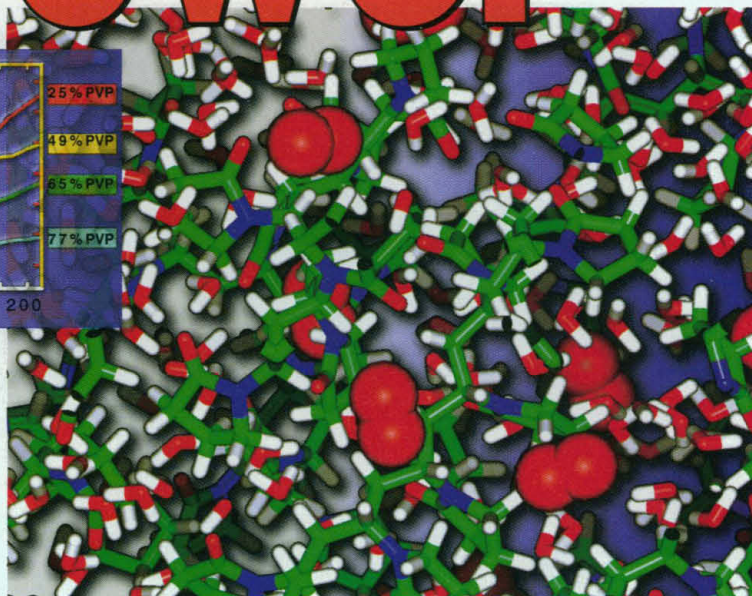
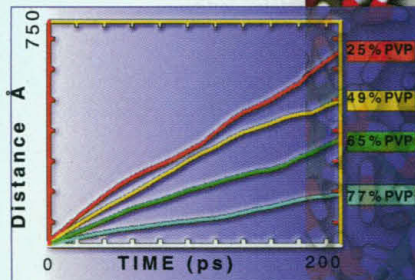




# Discover **Power**

in

*Simulation  
Technology*



Contact Lens Design: Diffusion of Oxygen in Polyvinylpyrrolidone (PVP) Hydrogels. Images generated by BIOSYM software and rendered on the Silicon Graphics® Indigo2™. SGI provides the most powerful desktop graphic systems, perfect for visualization and simulation.



**Discover** the **power** to calculate larger, more complex molecular design problems with far greater speed and accuracy. Now, using **Discover**®, all the parameters you need for advanced simulations of organic, inorganic and biological systems are easily available within one program...adding **power** to your research in Protein Modeling, Homology Refinement, NMR Spectroscopy, Solvation Modeling, Drug Design and Property Prediction • **Discover**'s tested, **powerful forcefields**, CFF91, CVFF, ESFF, and Amber, range in complexity and accuracy. You can customize your simulations and analyses through its **open architecture**. And it is optimized for performance on Silicon Graphics, IBM, Cray, Convex and Fujitsu, including parallel processors. • **New** in Fall '95 is CFF95, a forcefield for **comprehensive** coverage of biopolymers, including nucleic acids, carbohydrates, lipids, and a broad range of small organic compounds. Using the **industry standard** for molecular mechanics and dynamics simulations gives you access to the most accurate forcefields and the broadest coverage of functional groups available – exclusively from **BIOSYM**.

Call **(619) 597-9755** for a **free** brochure

**BIOSYM**  
Technologies

Computational  
Chemistry

(619) 458-9990 • Fax: (619) 597-9777 • [solutions@biosym.com](mailto:solutions@biosym.com) • <http://www.biosym.com/biosym/>  
UNITED STATES • ASIA • EUROPE

a **CORNING** company

Circle No. 28 on Readers' Service Card



# INBRED MICE



BALB/c • C3H • C57BL/6 • DBA/2  
• FVB • Fox Chase CB17™



**Charles River**  
LABORATORIES

Contributing to the Search for Healthier Lives™

251 Ballardvale Street, Wilmington, MA 01887 1-800-LAB-RATS



Fox Chase CB17 is a trademark of the Fox Chase Cancer Center  
© Charles River Laboratories, 1995

Circle No. 9 on Readers' Service Card

# Get to the Point

**F A S T!**

**Data Desk is fast, visual data analysis software** that takes you straight to the heart of your data. Its dynamically linked graphics show you key patterns and relationships—even the first time you use the program. The fastest calculations of *any* Macintosh statistics package let you spend less time computing—even for the largest datasets.

## Start Fast

"The program teams ease of use with advanced features, making it a good choice for novices as well as experienced statisticians." —MACUSER, 9/93

★★★★½

## Compute Fast

"The fastest statistics package for the Macintosh, and it is also the easiest statistics program to use on any platform." —WALTER T. LINDE-ZWIRBLE, CLINICAL OUTCOMES, SUMMER 93

## Analyze Fast

"Its user interface and recalculation speed actively encourage users to examine data sets using many different tools." —MACWEEK, 7/5/93

★★★★

## Get to the Point Fast

"For getting to the heart of the matter, which is finding patterns in data, Data Desk 4.0 has no peer." —MACWORLD, 5/93

★★★★



**Data Desk**  
The Fast, Visual Tool for Data Analysis

DATA DESCRIPTION, INC., P.O. Box 4555, ITHACA, NY 14852



CALL FOR A FREE MAC DEMO! 800-573-5121

Circle No. 8 on Readers' Service Card

## PERSONAL BIBLIOGRAPHIC DATABASES...

*These cost more:*

ENDNOTE • DMS 4 CITE • PRO-CITE  
REFERENCE MANAGER • REF-11

*This does more:*

**PAPYRUS™**  
Version 7!

- Manages up to 2 million reference citations. Stores up to 16,000 characters and 100 keywords per reference.
- Dozens of predefined output formats, plus the ability to easily design your own.
- 100% compatible with WordPerfect\*, Microsoft Word\*, Ami Pro\*, WordStar, XyWrite, Signature, ChiWriter, TeX. \*including Windows™ versions
- Can also be used with virtually all other word processors.
- Fast, powerful search capabilities.
- Able to import references from national databases, CD-ROM files, monthly diskette services, other bibliography programs, or almost any other database or text file.
- Allows an unlimited number of Notecards for each reference.
- Powerful new user interface.
- Fully compatible with Windows™.

for IBM-PC and compatibles  
also available for VAX-VMS  
Macintosh version under development

**Research**  
SOFTWARE DESIGN

2718 SW Kelly Street, Suite 181  
Portland, OR 97201  
(503) 796-1368 FAX: 503-241-4260

**Complete System \$99**

Full money-back guarantee  
on purchase of Complete System.

**Demo System \$25**

Demo price credited toward subsequent Complete System purchase.

Outside North America, add \$20 shipping  
charge - U.S. funds, on a U.S. bank.

Circle No. 20 on Readers' Service Card

## A Revolution in Oligonucleotide Synthesis!

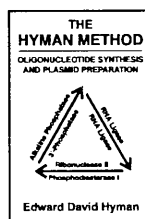
### Throw away your amidite machines

Announcing the Hyman method, a new method for synthesizing oligos.

- entirely enzymatic, no highly reactive chemicals or functional groups
- entirely aqueous system, no organic solvents
- entirely solution based, no columns
- low cost nucleotide reagents, stable in water, stable to heat
- no base protecting groups, no post-synthetic deprotection
- 30 to 60 minute cycle time
- continuous synthesis scale, 0.1 ml to 1,000,000+ liters
- all biodegradable and non-toxic, no waste disposal problems
- simple post-synthetic purification, no reverse phase columns
- ideal for inexpensive pharmaceutical scale oligo production
- simultaneous synthesis of 1,000 oligos per day on a benchtop machine
- ideal for molecular biology applications, sequencing primers, PCR, etc.
- makes DNA, RNA, 2'-O-CH<sub>3</sub> RNA, arabinose, and chimeric oligos
- makes oligos with base analogs, fluorescent or biotin tags, wobbles, etc.

If you are planning a project which uses oligos, learn in detail how this new technology works and how it can enhance your project capabilities. Do not make the mistake of buying an amidite machine, which will be outdated by the time you receive it. Learn how the next generation of benchtop oligo synthesizers will offer 100 fold increased throughput.

**Title: The Hyman Method:  
Oligonucleotide Synthesis and Plasmid Preparation**



219 pp, 64 tables and illus, ISBN 0-9645452-0-9  
Author: Edward David Hyman, copyrighted  
\$ 85.00, Visa/MC accepted

Sybtrel Biotechnology  
1500 Edwards Avenue, suite Q  
Harahan, LA, 70123, USA  
tel: 504-733-3849, fax: 504-734-5106

Circle No. 48 on Readers' Service Card



# INTERCIENCIA

On behalf of Interciencia Association, the American Association for the Advancement of Science wishes to invite you to attend the *Interciencia Pan American Scientific Symposium* on August 23-25, 1995, in San Juan, Puerto Rico.

Experts will discuss topics related to:

- ▶ Molecular mechanisms of drug-resistant genes in plasmodium
- ▶ Structure and function of proteins
- ▶ Plantain extract as an alternative against Tb bacillus
- ▶ Solar Detoxification
- ▶ Solar Energy Cars

The challenges and opportunities in industrial microbiology and biotechnology and science and technology policy for Western Hemisphere countries will also be discussed.

For further information, contact: Luis A. Salicrup, President, Association for Puerto Ricans in Science and Engineering (APRSE), tel: 809-722-8729; 723-3459, fax: 809-759-6411; 760-5638

Interciencia Association, a 16-nation federation of organizations promoting collaboration in science and technology in the Americas, publishes INTERCIENCIA, a tri-lingual journal of science and technology. The AAAS is the U.S. member.

## THE AAAS PROGRAM ON SCIENCE AND INTERNATIONAL SECURITY INVITES APPLICATIONS FOR

### THE HILLIARD RODERICK PRIZE FOR EXCELLENCE IN SCIENCE, ARMS CONTROL, AND INTERNATIONAL SECURITY

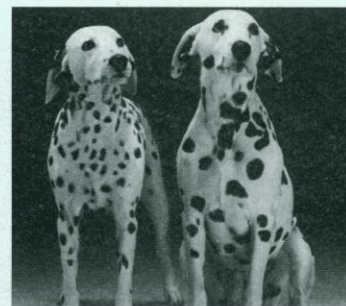
❖ To acknowledge recent outstanding contributions that advance our understanding of issues related to arms control and international security and that have an important scientific or technical dimension.

❖ Technology development, scholarly publications, timely analyses, and other professional activities that have advanced our thinking about these issues will be considered. A prize of \$5,000 plus a commemorative medal will be awarded at the 1996 AAAS Annual Meeting. *Deadline for submission of materials is 1 August 1995.*

❖ For more information about the Hilliard Roderick Prize, contact the AAAS Program on Science and International Security at 1333 H Street, NW, Washington, DC 20005; or 202/326-6490; 202/371-0970 (Fax); or PSIS@AAAS.ORG (e-mail).

Investigator™

## Electrophoresis Brought To Life



### Spot the difference...

The power of 2-D electrophoresis is now brought to both analytical and preparative scale applications. Using Oxford GlycoSystems' Investigator™ 2-D electrophoresis system, you can move easily from 1st dimension isoelectric focusing (IEF) to 2nd dimension PAGE gels, then to blotting and sequencing your target protein.

### ...an obvious choice

Investigator 2-D systems are the most widely used complete 2-D electrophoresis systems.

- Duracryl™ high performance gels
- Dedicated reagents
- High resolution and reproducibility
- Integrated temperature control system
- Up to 10 gels per run
- Preparative gels

With a capacity of up to 1 mg protein total, and recovery of up to 10 µg from a single spot, you'll find the Investigator the obvious choice.

For a FREE information pack on how Investigator™ systems can improve your electrophoresis applications contact us today.

Oxford GlycoSystems

USA and Canada: Tel: (617) 533 0100,  
Fax: (617) 533 0101, Tollfree: 1-800 722 2597  
UK and Europe: Tel: +44 (0)1235 553066,  
Fax: +44 (0)1235 554701, Tollfree: 0800 212061  
Tollfree to UK from: Switzerland 155 2739;  
France 0590 86 08; Germany 0130 81 37 48  
Japan: Tel: 3-3862-2108, Fax: 3-3866-5165



# Cambridge—The Scientist's Best Friend

## Species Diversity in Space and Time

**Michael L. Rosenzweig**

Answers questions relevant to the many still-unexplained species diversity patterns. As evolutionary ecologists race to understand biodiversity, this book will help set the agenda for diversity research into the next century.

1995 456 pp.  
49618-7 Hardback \$74.95/£50.00  
49952-6 Paperback \$27.95/£17.95



## Colour

Art and Science

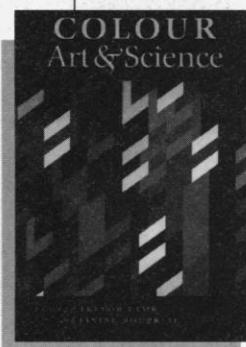
**Trevor Lamb and**

**Janine Bourriau, Editors**

Eight experts from different fields of study (including culture and language, physics, psychology, and physiology) provide their views on color. Written in nontechnical language, this book is a unique blending of fine arts and science on a subject that affects almost all of us.

*The Darwin College Lectures*

1995 246 pp.  
49645-4 Hardback \$59.95/£35.00  
49963-1 Paperback \$24.95/£17.95



## Gene Cloning and Manipulation

**Christopher Howe**

Stressing the underlying principles of genetic manipulation in a wide range of organisms, this book describes the principles behind cloning in DNA in *E. coli*—the enzymes used, the range of cloning vectors available, and how to screen libraries to find particular clones.

1995 223 pp.  
40341-3 Hardback \$44.95/£30.00  
40700-1 Paperback \$19.95/£14.95

## Managing Habitats for Conservation

**William J. Sutherland and**  
**David A. Hill, Editors**

Providing a comprehensive habitat-by-habitat guide to conservation management based on scientific principles as well as practical experience. Highlights potential problems and provides examples of past habitat management.

1995 409 pp.  
44260-5 Hardback \$84.95/£55.00  
44776-3 Paperback \$29.95/£17.95

## Coastal Evolution

Late Quaternary

Shoreline

Morphodynamics

**R.W.G. Carter and**

**C.D. Woodroffe,**

**Editors**

Assesses how coastlines change and how they have evolved over the last few thousand years. It introduces some of the latest concepts in coastal morphodynamics, recognizing that coasts develop through co-adjustment of process and form.

1995 532 pp.  
41976-X Hardback \$79.95/£50.00

## Bird Life of Woodland and Forest

**Robert J. Fuller**

Considers the variation in bird life in woodlands and the factors that influence bird numbers and distributions.

*Bird Life Series 3*

1995 258 pp.  
33118-8 Hardback \$64.95/£24.95

## Global Geological Record of Lake Basins

**E. Gierlowski-Kordesch and**  
**Kerry Kelts**

A concise summary of the information available on a global spectrum of lacustrine deposits—looking in particular at paleoenvironmental aspects.

*World and Regional Geology Series 4*

1995 462 pp.  
41452-0 Hardback \$120.00/£80.00

## Optics in the Age of Euler

Conceptions of the Nature of Light, 1700-1795

**Casper Hakfoort**

Studies the eighteenth-century origins and early phase of a fundamental debate in optics: whether light is a particle or wave. Specifically, it is the first in-depth study of the contents and reception of Leonhard Euler's wave theory of light published in 1746.

1995 254 pp.  
40471-1 Hardback \$64.95/£35.00

## The Hemopoietic Colony-Stimulating Factors

From Biology to Clinical Applications

**Donald Metcalf and**

**Nicos Anthony Nicola**

Provides a detailed and up-to-date account of the discovery of the CSFs, their structure, molecular biology and cellular receptors, the biology of the CSFs *in vivo* and *in vitro*, and their present and future clinical applications.

1995 352 pp.  
46158-8 Hardback \$64.95/£37.50

## Neurobiological Effects of Sex Steroid Hormones

**Paul E. Micevych and**

**Ronald P. Hammer, Jr., Editors**

Examines the neurobiological bases for the understanding of the interactions between the sex hormones (estrogen and testosterone) and the brain.

1995 462 pp.  
45430-1 Hardback \$84.95/£55.00

*Reissued...*

## The Development of Darwin's Theory

Natural History, Natural Theology, and Natural Selection, 1838-1859

**Dov Ospovat**

Ospovat shows that Darwin was not the scientific recluse of popular myth. He also indicates that there was a theological basis for much of Darwin's original 1838-1844 theory, and how his later principle of divergence was influenced by his belief in evolutionary progress.

1995 318 pp.  
46940-6 Paperback \$22.95/£14.95

## British Plant Communities

Volume 4: Aquatic Communities, Swamps and Tall-herb Fens

**J.S. Rodwell, Editor**

The first systematic and comprehensive account of the vegetation types of this country. It covers all natural, semi-natural and major artificial habitats in Great Britain (but not Northern Ireland), representing the fruits of fifteen years' research by leading plant ecologists.

1995 296 pp.  
39168-7 Hardback \$99.95/£60.00

Available in bookstores or from

**CAMBRIDGE**  
**UNIVERSITY PRESS**

40 West 20th Street, New York, NY 10011-4211

Call toll-free 800-872-7423

The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, U.K.

MasterCard/Visa accepted. Prices subject to change



# Pulling Power

...with this  
much control



Courtesy of San Francisco Maritime Museum

## Model P-97

Sutter micropipette pullers are the finest available. Built-in versatility and repeatability are based on 20 years of continuous research and development.

**Sutter**  
Instrument Company  
40 Leveroni Court  
Novato CA 94949

phone 415-883-0128 fax 415-883-0572

Circle No. 6 on Readers' Service Card

## AAAS Science and Technology Policy Yearbook 1994

Albert H. Teich, Stephen D. Nelson and  
Celia McEnaney, editors

Published by the American Association for the  
Advancement of Science

The fourth volume in the *AAAS Yearbook* series presents selected papers from the 19th AAAS Science and Technology Policy Colloquium, held in April 1994, together with other original articles, addresses from the 1994 AAAS Annual Meeting, and excerpts from influential reports. Authors include many notable figures in S&T policy, also included is a reprint of the 1945 landmark report *Science—The Endless Frontier* by Vannevar Bush.

1994; 447 pages; index; softcover; ISBN 0-87168-533-7  
\$24.95 (AAAS member price \$19.96) Purchase the AAAS 1991, 1992, and 1993 Yearbooks for only \$8.00 each. Postage/handling per order \$4.00.  
Mail your order to:  
AAAS Distribution Center, PO Box 521, Annapolis Junction, MD 20701  
If you prefer to order by phone (VISA/MasterCard only, call 1-800-222-7809 (8:30am - 5:00pm ET). Fax orders to 301-206-9789.

## REQUEST FOR APPLICATIONS

### Pathogenesis and Treatment of Cystic Fibrosis

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), the National Heart, Lung, and Blood Institute (NHLBI) and the Cystic Fibrosis Foundation (CFF) invite investigator-initiated research applications to elucidate the pathogenesis of cystic fibrosis (CF) and its complications and to develop and characterize new therapeutic approaches for the treatment and ultimate cure of CF.

Research areas include but are not limited to:

- Molecular mechanisms by which mutations in CFTR cause dysfunction and/or strategies to enhance the function of mutant CFTR;
- Processing, trafficking and folding of CFTR and/or strategies to enhance targeting of mutant CFTR to the cell membrane;
- Molecular mechanisms underlying the inflammation and infection characteristic of CF, mechanisms underlying other complications of CF, and/or strategies to prevent or ameliorate these complications;
- Elucidation of the pathways of electrolyte transport in affected epithelia and/or strategies to circumvent the transport defects in CF;
- Identification of other cellular processes in which CFTR plays a role and the mechanisms by which mutations in CFTR may affect these processes; and
- Development of safe and effective methods for gene therapy or other treatments for CF.

Research approaches must be directly relevant to cystic fibrosis. Applications must be submitted to the NIH. **Proposals which are judged meritorious but are not funded by the NIH will be considered for support by the CFF.**

NIH support will be provided as grants-in-aid for up to four years. CFF support is available for up to two years.

The deadline for letters of intent is October 24 and for applications is November 28, 1995. For the full text of the RFA, contact **Judith Fradkin, M.D.**, Chief Endocrinology and Metabolic Diseases Branch, NIDDK, Natcher Bldg., Rm. 5AN-12E, 45 Center Dr. MSC 6600, Bethesda, MD 20892-6600 (EMail FradkinJ@ep.niddk.nih.gov) or telephone: (301) 594-8815; or **Susan Banks-Schlegel, Ph.D.**, Director, Asthma and CF Program, NHLBI, 2 Rockledge Center, Ste. 10018, 6701 Rockledge Dr., Bethesda, MD 20892-7952 (EMail Susan Banks-Schlegel@nihhhroc1.bitnet) or telephone: (301) 435-0202. For information about the CFF award, contact **Robert J. Beall, Ph.D.**, President and CEO, CFF, 6931 Arlington Rd., Ste. 200 Bethesda, MD 20814.



National Heart, Lung,  
and Blood Institute

