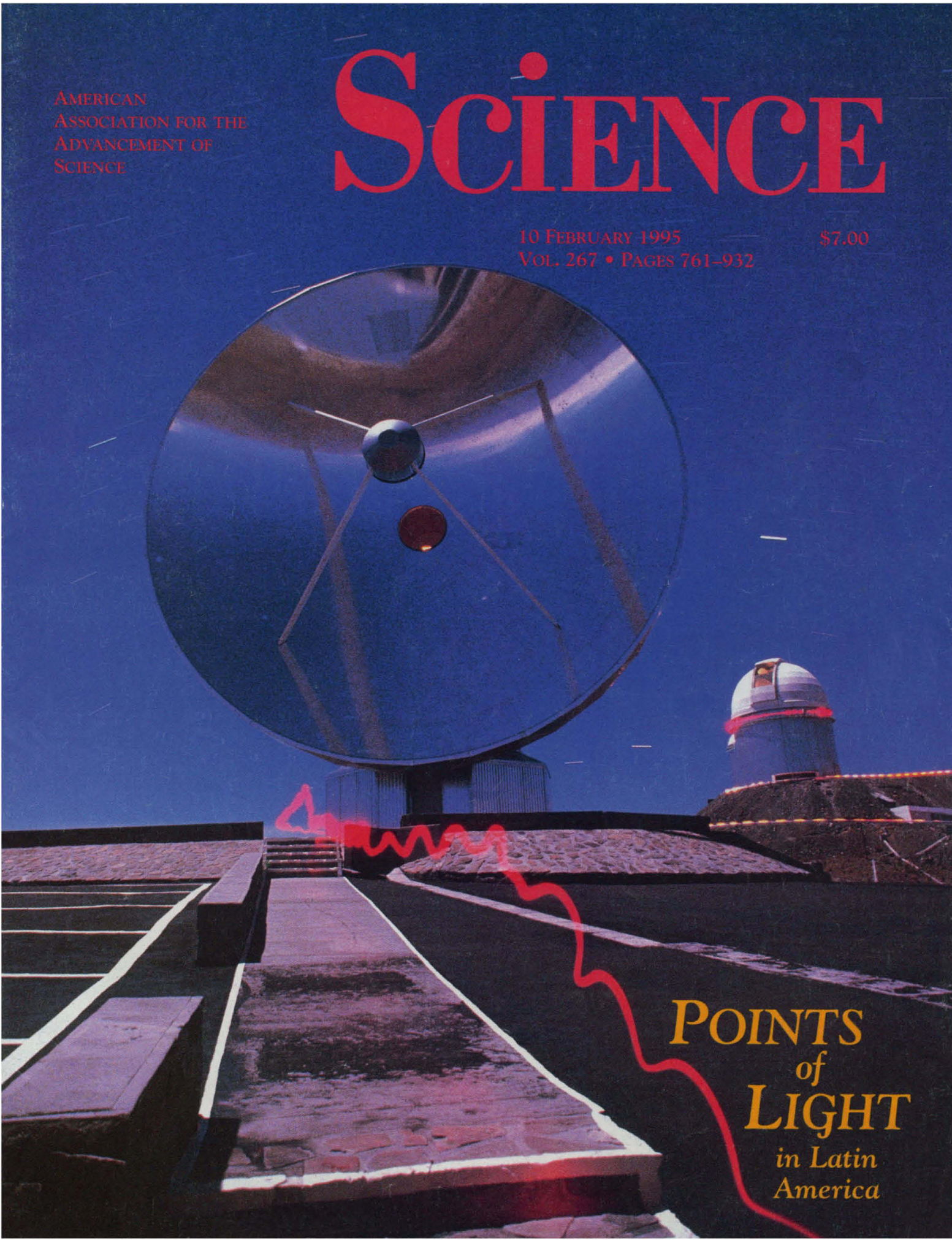


AMERICAN  
ASSOCIATION FOR THE  
ADVANCEMENT OF  
SCIENCE

# SCIENCE

10 FEBRUARY 1995  
VOL. 267 • PAGES 761-932

\$7.00



POINTS  
of  
LIGHT  
in Latin  
America



**Imagine....**a temperature cycler that can cycle all 96 wells and maintain a uniformity of  $\pm 0.1^{\circ}\text{C}$  (yes, even the outer wells).

**Imagine....**being able to program this same temperature cycler with a temperature gradient of up to  $22^{\circ}\text{C}$  (optimizing annealing reactions and increasing speed up to 30%).

**Imagine....** many other novel features and a great price.

Let your imagination  
run wild with the  
**RoboCycler™ Gradient 96**  
temperature cycler.

**Call for a demo and complete ordering information.**



USA:  
Corporate Headquarters  
Easy Ordering: (800)424-5444  
Telefax: (619)535-0034

Germany:  
Stratagene GmbH  
Telephone: (06221) 400634  
Telefax: (06221) 400639

United Kingdom:  
Stratagene Ltd.  
Telephone: (0223) 420955  
Telefax: (0223) 420234

Switzerland:  
Stratagene GmbH  
Telephone: (01) 3641106  
Telefax: (01) 3657707

Internet:  
[tech\\_services@stratagene.com](mailto:tech_services@stratagene.com)

Circle No. 39 on Readers' Service Card



# STATISTICA/w

Windows,  
DOS, Macintosh

**STATISTICA®** (for Windows) ■ A complete data analysis system with thousands of on-screen customizable, presentation-quality graphs fully integrated with all procedures ■ Comprehensive *Windows™* support, OLE (client and server), DDE, customizable *Auto Task* toolbars, pop-up menus ■ Multiple data-, results-, and graph-windows with *data-graph* links ■ The largest selection of statistics and graphs in a single system; comprehensive implementations of: Exploratory techniques with advanced brushing; multi-way tables with banners (presentation-quality reports); nonparametrics; distribution fitting; multiple regression; general nonlinear estimation; stepwise logit/probit; general ANCOVA/MANCOVA; stepwise discriminant analysis; log-linear analysis; confirmatory/exploratory factor analysis; cluster analysis; multidimensional scaling; canonical correlation; item analysis/reliability; survival analysis; a large selection of time series modeling/forecasting techniques; structural equation modeling with *Monte Carlo* simulations; and much more ■ On-line *Electronic Manual* with comprehensive introductions to each procedure and examples ■ Hypertext-based *Stats Advisor* expert system ■ Workbooks with multiple *AutoOpen* documents (e.g., graphs, reports) ■ Extensive data management facilities (fast spreadsheet of unlimited capacity with long formulas, *Drag-and-Drop*, *AutoFill*, *Auto-Recalculate*, split-screen/variable-speed scrolling, advanced Clipboard support, DDE links, hot links to graphs, relational merge, data verification/cleaning) ■ Powerful *STATISTICA BASIC* language with matrix operations, full graphics support, and interface to external programs (*DLLs*) ■ Batch command language and macros, flexible "turn-key" and automation options, customized procedures can be added to floating *Auto Task* toolbars ■ All output displayed in *Scrollsheets™* (dynamic, customizable, presentation-quality tables with instant 2D, 3D, and multiple graphs) or word processor-style report editor (of unlimited capacity) that combines text and graphs ■ Extremely large analysis designs (e.g., correlation matrices up to 32,000x32,000, unlimited ANOVA designs) ■ Megafile Manager with up to 32,000 variables (8 Mb) per record ■ Unlimited size of files; extended ("quadruple") precision; unmatched speed ■ Exchanges data and graphs with other applications via DDE, OLE, or an extensive selection of file import/export facilities (incl. *ODBC* access to virtually all data bases and mainframe files) ■ Hundreds of types of graphs, incl. categorized multiple 2D and 3D graphs, ternary 2D/3D graphs, matrix plots, icons, and unique multivariate (e.g., 4D) graphs ■ Facilities to custom-design new graph types and add them permanently to menus or toolbars ■ On-screen graph customization with advanced drawing tools (e.g., scrolling and editing of complex objects in 32x real zoom mode), compound (nested) OLE documents, *Multiple-Graph AutoLayout Wizard*, templates, special effects, icons, page layout control for slides and printouts; unmatched speed of graph redraw ■ Interactive rotation, perspective and cross-sections of 3D displays ■ Large selection of tools for graphical exploration of data: extensive brushing tools with animation, fitting, smoothing, overlaying, spectral planes, projections, layered compressions, marked subsets ■ Price **\$995**.

**Quick STATISTICA** (for Windows) ■ A subset of *STATISTICA*; comprehensive selection of basic statistics and the full analytic and presentation-quality graphics capabilities of *STATISTICA* ■ Price **\$495**.

**STATISTICA/QC - Industrial statistics add-on package** (requires *STATISTICA* or *Quick STATISTICA* for Windows) ■ The largest selection of industrial statistics in a single package; quality control charts (compatible with real-time data acquisition systems), process capability analysis, R&R, sampling plans, and an extremely comprehensive selection of experimental design (DOE) methods ■ Flexible tools to customize and automate all analyses and reports (incl. "turn-key" system options, and tools to add custom procedures) ■ Price **\$495**.

**STATISTICA/DOS** (for DOS) ■ Price **\$795** (Quick - **\$295**).

Domestic sh/h \$12 per product; 30-day money back guarantee.

Circle No. 16 on Readers' Service Card

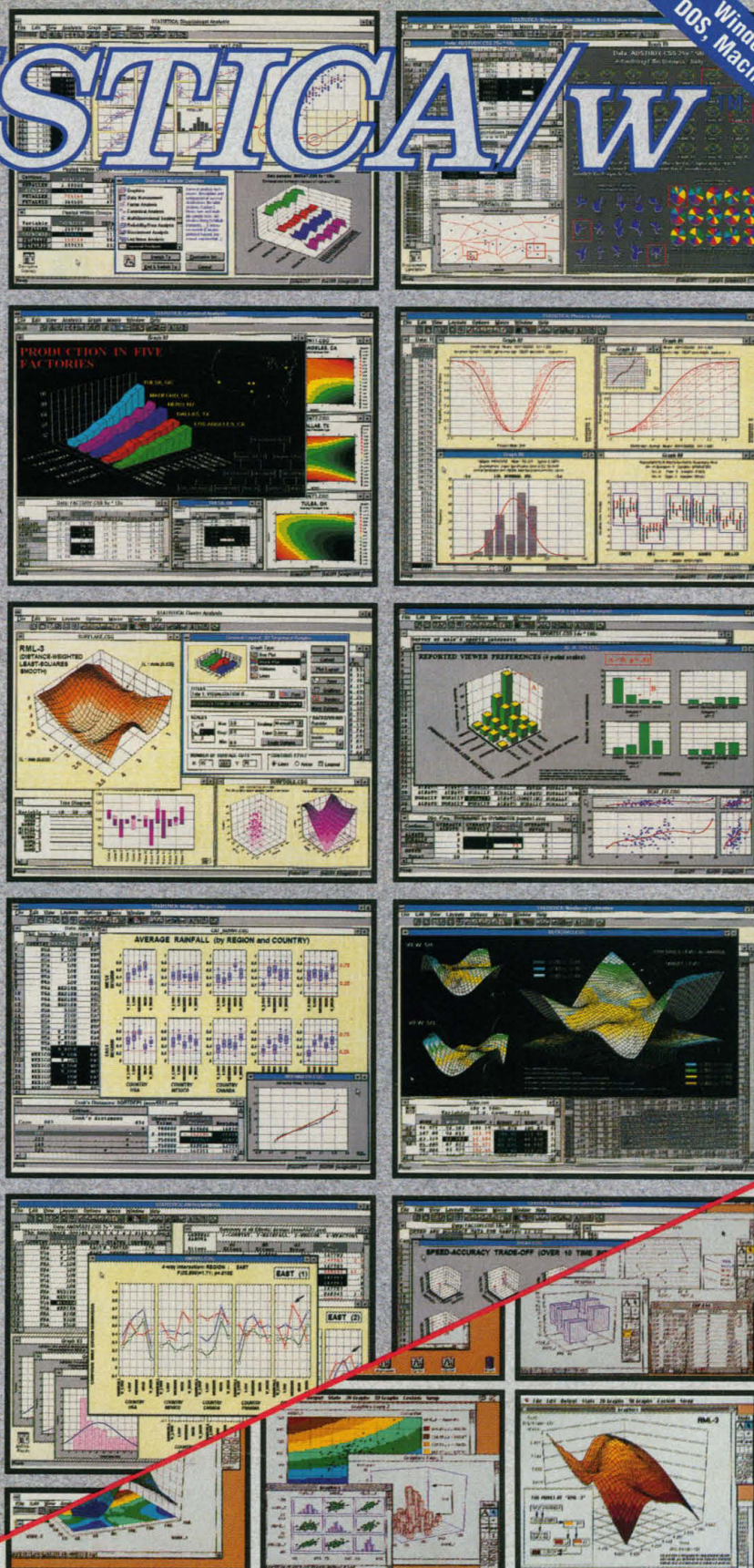


**StatSoft™**

2325 E. 13th St. • Tulsa, OK 74104 • (918) 583-4149  
Fax: (918) 583-4376

Overseas Offices: StatSoft of Europe (Hamburg, FRG), ph: 040/4200347, fax: 040/4911310; StatSoft UK (London, UK), ph: 0462/482822, fax: 0462/482855; StatSoft Pacific (Melbourne, Australia), ph: (03) 663 6580, fax: (03) 663 6117; StatSoft France (Paris), ph: (1) 45 66 97 00, fax: (1) 45 66 06 51; Available from other Authorized Representatives worldwide: Sweden: AkademiData Scientific AB ph: 018-210035, fax: 018-210039; Finland: Statsoft Oy ph: 24-334678, fax: 24-333867; Belgium: Texma Newtech 10 61 16 28; South Africa: Osiris Technical Systems 12-663-4500; Japan (Macintosh): Three's Company, Inc., 03-3770-7600; Japan (Windows): Design Technologies, Inc., 03-3667-1110.

StatSoft, STATISTICA/Mac, Quick STATISTICA/Mac, STATISTICA/w, Quick STATISTICA/w, and Scrollsheet are trademarks of StatSoft, Inc.; Macintosh, Mac IIfx, Excel and MacDraw are trademarks of their respective companies.

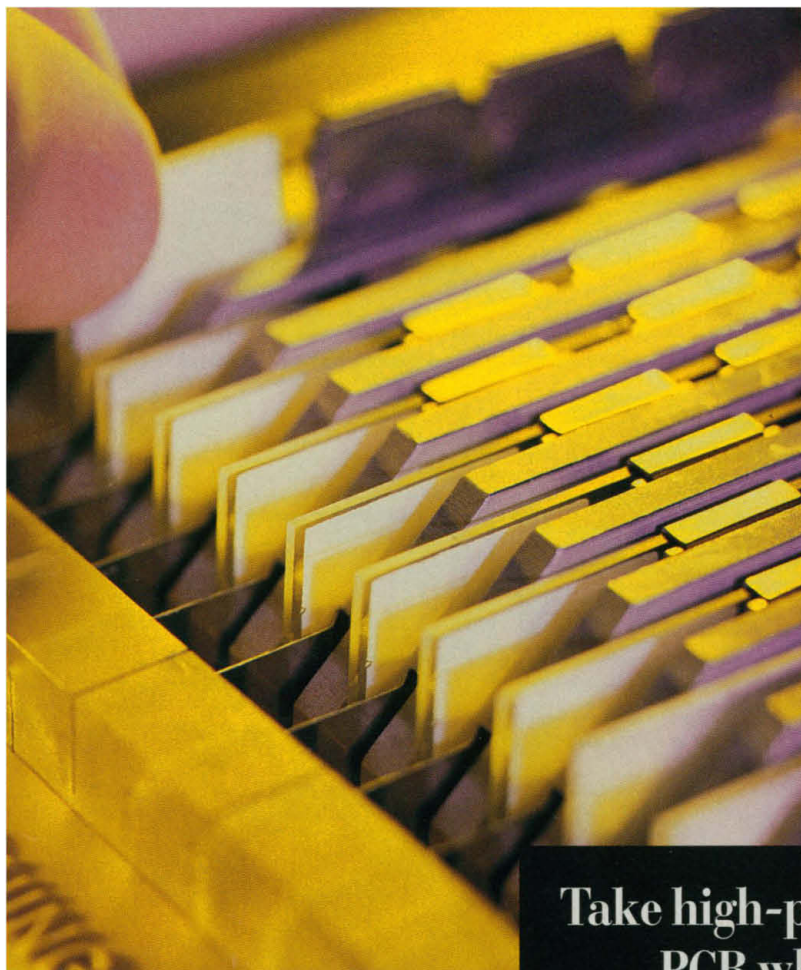


**STATISTICA/Mac™** (for Macintosh) A *STATISTICA/w*-compatible, comprehensive data analysis and graphics system designed for the Macintosh ■ Large selection of statistical methods fully integrated with presentation-quality graphics (incl. EDA, multiplots, a wide selection of interactively rotatable 3D graphs; MacDraw-style tools) ■ Unlimited size of files ■ Full support for System 7, incl. "Publish and Subscribe" ■ Price **\$695**.

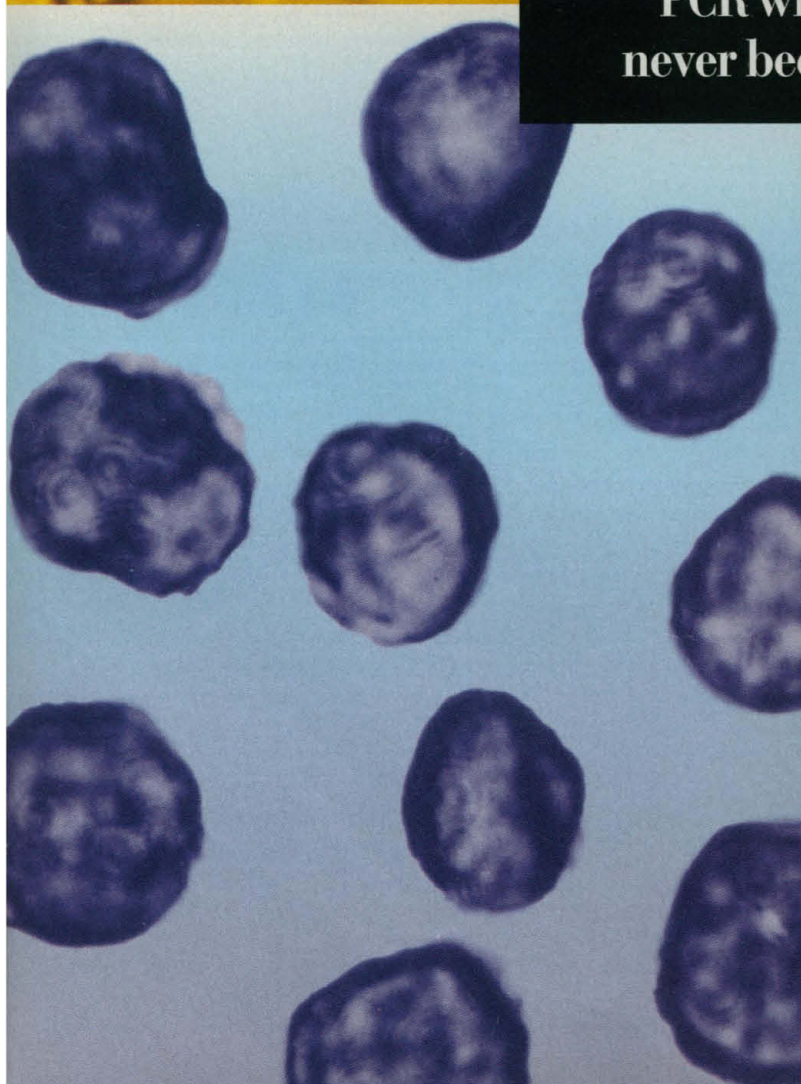
**Quick STATISTICA/Mac™** (for Macintosh) A subset of *STATISTICA/Mac*; a comprehensive selection of basic statistics and the full graphics capabilities of *STATISTICA/Mac* ■ Price **\$395**.







**Take high-performance  
PCR where it's  
never been before.**





Now *in situ* PCR is everything it should be. Robust. Reproducible. Convenient. The new GeneAmp® *In Situ* PCR System 1000,\* with co-optimized reagents and accessories, expands the power of PCR into the cell. This innovative system streamlines the entire process and provides consistently superior results.

### Engineered for PCR Excellence

Our novel sample block, accessories and proven thermal cycler design ensure cycle-to-cycle, slide-to-slide uniformity for highly reproducible results. The 10-slide block with vertical slots maximizes thermal contact—without mineral oil—to guarantee optimal PCR performance. Up to 30 samples can be amplified each run.

Setup is convenient with our AmpliCover™ Discs and Clips and silane-treated Glass Slides. These accessories create a standardized reaction chamber, eliminating the need for messy adhesives. The system has also been designed to allow Hot Starts for enhanced *in situ* PCR specificity.

### Reagents Optimized for *In Situ* PCR

This complete system is the first to include reagents developed specifically for *in situ* PCR. We've formulated AmpliTaq® DNA Polymerase, *IS*, for efficient *in situ* PCR on a variety of sample types. All GeneAmp® *in situ* PCR reagents are optimized on our GeneAmp *In Situ* PCR System 1000. And our experienced PCR specialists are available worldwide to



GeneAmp *In Situ* PCR System 1000 (left).

Localization of varicella zoster virus (VZV), by *in situ* PCR in neuronal ganglia of patient either negative (center) or positive (right) by serology for VZV.

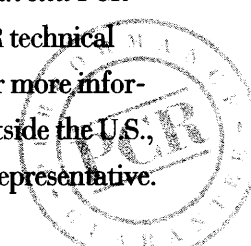
provide expert technical assistance.

With the integrated resources of our Applied Biosystems Division, you have access to the most comprehensive range of systems, technolo-

gies and support in PCR, nucleic acid synthesis, genetic analysis and protein research.

Take high performance PCR where it's

never been before with the GeneAmp *In Situ* PCR System 1000 and our line of *in situ* PCR reagents and accessories. For PCR technical support, call 1-800-762-4001. For more information, call 1-800-345-5224. Outside the U.S., contact your local Perkin-Elmer representative.



## PERKIN ELMER

**Europe** Langen, Germany Tel: 49-6103-708-0 Fax: 49-6103-708-210  
**Canada** Mississauga, Canada Tel: 905-821-8183 Fax: 905-821-8246  
**Japan** Tokyo, Japan Tel: 81-4-7380-8500 Fax: 81-4-7380-8505  
**Latin America** Mexico City, Mexico Tel: 52-5-651-7077 Fax: 52-5-593-6223  
**Australia** Melbourne, Australia Tel: 61-3-212-8585 Fax: 61-3-212-8502

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



\* patents pending  
GeneAmp and AmpliTaq are registered trademarks of Roche Molecular Systems, Inc.  
The GeneAmp PCR process is covered by the U.S. patents owned by Hoffmann-La Roche, Inc. and F. Hoffmann-La Roche Ltd.  
AmpliCover is a trademark of The Perkin-Elmer Corporation.  
Perkin-Elmer is a registered trademark of The Perkin-Elmer Corporation.







**780**  
Clinton's R&D  
proposals



**791 & 902**  
Homosexual behavior  
in flies

## NEWS & COMMENT

Clinton Holds the Line on R&D	780
Priority Initiatives Squeeze Science	782
A Strategy for Sequencing the Genome 5 Years Early	783
Science Editor-in-Chief Named	784
Blending Biology, Technology, and Economic Development	785
DOE Reacts Coolly to Galvin Report But Favors Downsizing	787

## RESEARCH NEWS

Found: Candidate for Missing Mass?	789
Bisexual Fruit Flies Point to Brain Courtship Centers	791
Galaxy Experts Train Electronic Stand-Ins	792
Protein Studies Try to Puzzle Out Alzheimer's Tangles	793
At Math Meetings, Enormous Theorem Eclipses Fermat	794

## PERSPECTIVES

Superpositions of Handed Wave Functions J. A. Cina and R. A. Harris	832
Casein Kinase II in Theileriosis O. K. Ole-Moiyoi	834

## SCIENCE IN LATIN AMERICA

### NEWS

Publication Trends: Uneven Growth	808
Latin America's Elite Looks North for Scientific Partners	809
Brazil: A Deadly Parasite Spurs Up-to-the-Minute Biology	811
Agency is Refuge in Funding Wilderness	812
Physicists Hand-Build a Synchrotron	813
Homely Fish Draws Attention to Amazon Deforestation	814
Argentina: A Once-Privileged Physics Lab Faces an Uncertain Future	815

Programmed Cell Death in Bacterial Populations M. B. Yarmolinsky	836
---	-----

## ARTICLES

Mantle Convection with Plates and Mobile, Faulted Plate Margins S. Zhong and M. Gurnis	838
Gauging Similarity with <i>n</i> -Grams: Language-Independent Sorting, Categorization, and Retrieval of Text M. Damashek	843

## REPORTS

Interhemispheric Differences in Polar Stratospheric HNO <sub>3</sub> , H <sub>2</sub> O, ClO, and O <sub>3</sub> M. L. Santee, W. G. Read, J. W. Waters, L. Froidevaux, G. L. Manney, D. A. Flower et al.	849
--	-----

## DEPARTMENTS

THIS WEEK IN SCIENCE	769	RANDOM SAMPLES	788
EDITORIAL	771	BOOK REVIEWS	909
Science in Latin America		<i>Chimpanzee Culture</i> , reviewed by D. L. Cheney • <i>The Coevolutionary Process</i> , M. Berenbaum • <i>Handbook of Membrane Channels</i> , C. Miller • Vignette	
LETTERS	773	PRODUCTS & MATERIALS	913
SCIENCESCOPE	779		

## Board of Reviewing Editors

Frederick W. Alt  
Don L. Anderson  
Michael Ashburner  
Stephen J. Benkovic  
David E. Bloom  
Floyd 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  
John C. Gerhart  
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  
Harold Weintraub  
Arthur Weiss  
Zena Werb  
George M. Whitesides  
Owen N. Witte  
William A. Wulf



## COVER

The SEST submillimeter radio telescope at the European Southern Observatory in Chile reflects the promise of science in Latin America as democracy and economic stability take hold. Chile's astronomers are doing competitive research on SEST and other instruments built by European and North American institu-

tions, and they plan to expand their activities. Elsewhere in the region, other scientific communities have started with fewer advantages but are creating equally bright spots of achievement, as discussed on page 807 in a special section on Science in Latin America. [Photo: Roger Ressmeyer-Starlight]



Patagonian Dinosaurs Reveal a Cosmopolitan Cretaceous	817
Chile: Astronomers Struggle to Keep Up With Their Opportunities	819
Biophysicists Re-Establish a Chilean Research Tradition	821
Mexico: A Stubborn Amoeba Takes Center Stage	822
Project Refines an Ancient Staple With Modern Science	824
<b>POLICY FORUMS</b>	
Science in Latin America	826
Future of Science in Latin America	827

Timing of Hot Spot-Related Volcanism and the Breakup of Madagascar and India  
M. Storey, J. J. Mahoney, A. D. Saunders, R. A. Duncan, S. P. Kelley, M. F. Coffin

Forearc Deformation and Great Subduction Earthquakes: Implications for Cascadia Offshore Earthquake Potential  
R. McCaffrey and C. Goldfinger

Galaxies, Human Eyes, and Artificial Neural Networks  
O. Lahav, A. Naim, R. J. Buta, H. G. Corwin, G. de Vaucouleurs, A. Dressler, J. P. Huchra *et al.*

Temperature Dependence of the Superconducting Gap Anisotropy in  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+x}$   
J. Ma, C. Quitmann, R. J. Kelley, H. Berger, G. Margaritondo, M. Onellion

A Neutral Templating Route to Mesoporous Molecular Sieves  
P. T. Tanev and T. J. Pinnavaia

Navigating Complex Labyrinths: Optimal Paths from Chemical Waves  
O. Steinbock, Á. Tóth, K. Showalter

Electrochemical Detection of Single Molecules  
F.-R. F. Fan and A. J. Bard

High Sex Ratios in China's Future  
S. Tuljapurkar, N. Li, M. W. Feldman

Shifting Dominance Within a Montane Vegetation Community: Results of a Climate-Warming Experiment  
J. Harte and R. Shaw

Effects of Competition, Colonization, and Extinction on Rodent Species Diversity  
T. J. Valone and J. H. Brown

Synergistic Roles for Receptor Occupancy and Aggregation in Integrin Transmembrane Function  
S. Miyamoto, S. K. Akiyama, K. M. Yamada

Biotherapy of B-Cell Precursor Leukemia by Targeting Genistein to CD19-Associated Tyrosine Kinases  
F. M. Uckun, W. E. Evans, C. J. Forsyth, K. G. Waddick, L. T. Ahlgren, L. M. Chelstrom *et al.*

Suppression of ICE and Apoptosis in Mammary Epithelial Cells by Extracellular Matrix  
N. Boudreau, C. J. Simpson, Z. Werb, M. J. Bissell

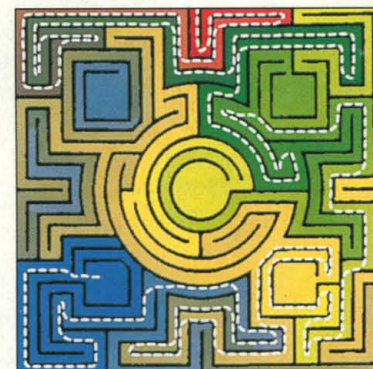
Casein Kinase II $\alpha$  Transgene-Induced Murine Lymphoma: Relation to Theileriosis in Cattle  
D. C. Seldin and P. Leder

Selfish Behavior of Restriction-Modification Systems  
T. Naito, K. Kusano, I. Kobayashi

Modulation of Chemotropism in the Developing Spinal Cord by Substance P  
C. De Felipe, R. D. Pinnock, S. P. Hunt

Genetic Feminization of Brain Structures and Changed Sexual Orientation in Male *Drosophila*  
J.-F. Ferveur, K. F. Störtkuhl, R. F. Stocker, R. J. Greenspan

**868**  
Maze waves



## AAAS Board of Directors

Eloise E. Clark  
Retiring President,  
Chairman  
Francisco J. Ayala  
President  
Rita R. Colwell  
President-elect

William A. Lester Jr.  
Simon A. Levin  
Anna C. Roosevelt

Alan Schriesheim  
Jean'ne M. Shreeve  
Chang-Lin Tien  
Warren M. Washington  
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 the base fee of \$1 per copy plus \$0.10 per page is paid directly to CCC, 27 Congress Street, Salem, MA 01970. The identification code for *Science* is 0036-8075/93 \$1 + .10. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.



You've Got Questions?  
We've Got Answers!  
Call for the 1995 invitrogen Catalog

**Invitrogen**



EXPRESSION SYSTEMS • PCR RELATED PRODUCTS • EXPRESSION VECTORS  
PRODUCTS FOR RNA/DNA ISOLATION • GENE TRANSFER PRODUCTS • cDNA SYNTHESIS • CUSTOM SERVICES

IN THE USA & CANADA CALL 1-800-955-6288

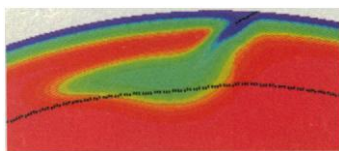
IN EUROPE CALL 31 (0) 5945-15175 OR CONTACT YOUR LOCAL DISTRIBUTOR.

Circle No. 32 on Readers' Service Card



## Model mantle

Mantle convection drives plate tectonics on the Earth's surface, but most models of mantle convection have focused on the internal dynamics of the mantle, neglecting other possibly important factors such as variable rheology, mobile plate margins, and large faults. Zhong and Gurnis (p. 838) present a model that includes such features and discuss how our understanding of internal mantle dynamics and the evolution of large plates might be changed; in their model, for example, migration of trenches is rapid before the



related subducted slab penetrates the lower mantle, but slow afterward.

## Wave from a maze

The simple method for escaping a maze is to search all paths until one is found that leads out. Steinbock *et al.* (p. 868) used chemical waves in excitable media to find the shortest path between two points in a labyrinth. The Belousov-Zhabotinsky oscillator reaction was set up in a membrane cut into the shape of a maze, and time-lapse imaging was used to follow the propagation of a wave initiated at a single point. At junctions in the maze, the wave splits, eventually traveling to all parts of the labyrinth. Velocity fields obtained from the images reveal the optimal path to any point. The authors suggest applications for their optimal pathfinder, and raise questions about the possible role of chemical waves in other excitable media such as neural pathways.

## The casein kinase connection

Theileriosis, a parasitic cattle disease, is a pseudoleukemia—infected cells resemble lymphoblasts and, like some human leukemias and tumors, overexpress casein kinase II (CKII), a protein kinase involved in many aspects of the cell cycle. Seldin and Leder (p. 894; see also Perspective by ole-MoiYoi, p. 834) created transgenic mice that express the catalytic alpha subunit of CKII in the lymphoid compartment. About 10% of these mice developed lymphomas, but offspring of the CKII mice with *c-myc* mice, *c-myc* having a known oncogenic role in lymphoma, produced offspring that were highly susceptible to neonatal leukemia. CKII thus provides a link between parasitology and tumor biology.

## Idiot savant

Automated methods to compare samples of text and categorize them by content often work by searching for key words or phrases, and require some degree of human preparation. Damashak (p. 843) offers a technique in which character sequences derived from text samples are compared in a purely mathematical way, without regard to meaning, and shows that documents with a common topic share statistical properties that allow them to be demonstrably distinguished from documents on an unrelated topic. The technique is fast, is not easily thrown off by errors and misspellings, and can be applied to any language, even Japanese.

## Artificial eyes

Astronomers classify galaxy shapes on a graduated spiral-to-elliptical scale, and this morphology shows many systematic correlations with the physical properties of galaxies. New telescopes and detectors, however, are generating sky surveys containing galaxies by the million, and classification by eye, from photographic images, is no longer feasible. Lahav *et al.* (p. 859; see also news by Travis, p. 792) have constructed a neural network to assign morphological

class to galaxies, and show that it can be trained to agree with expert astronomers at least as well as the experts agree among themselves.

## China men

The successful effort by the Chinese government to reduce the country's fertility rate has also substantially increased the ratio of male to female births because sons are judged better able to support their aging parents. Statistical projections by Tuljapurkar *et al.* (p. 874) show that by the middle of the next century, marriageable males could outnumber marriageable females by 10%, or 1 million, and that changes in the age of first marriage or the age difference between partners will have little effect on the magnitude of this excess.

## When the rat's away ...

The composition of a community of organisms is the result of complex and numerous interactions. Valone and Brown (p. 880) have conducted a long-term ecological experiment in the Arizona desert to investigate the consequences of removing a single animal, the kangaroo rat, from the natural com-

munity. When kangaroo rats are excluded, the variety of other rodent species increases. Similar consequences have been noted when a dominant predator is removed, but in this case the effect is mediated through changed competition for food and habitat.

## Multiple occupancy

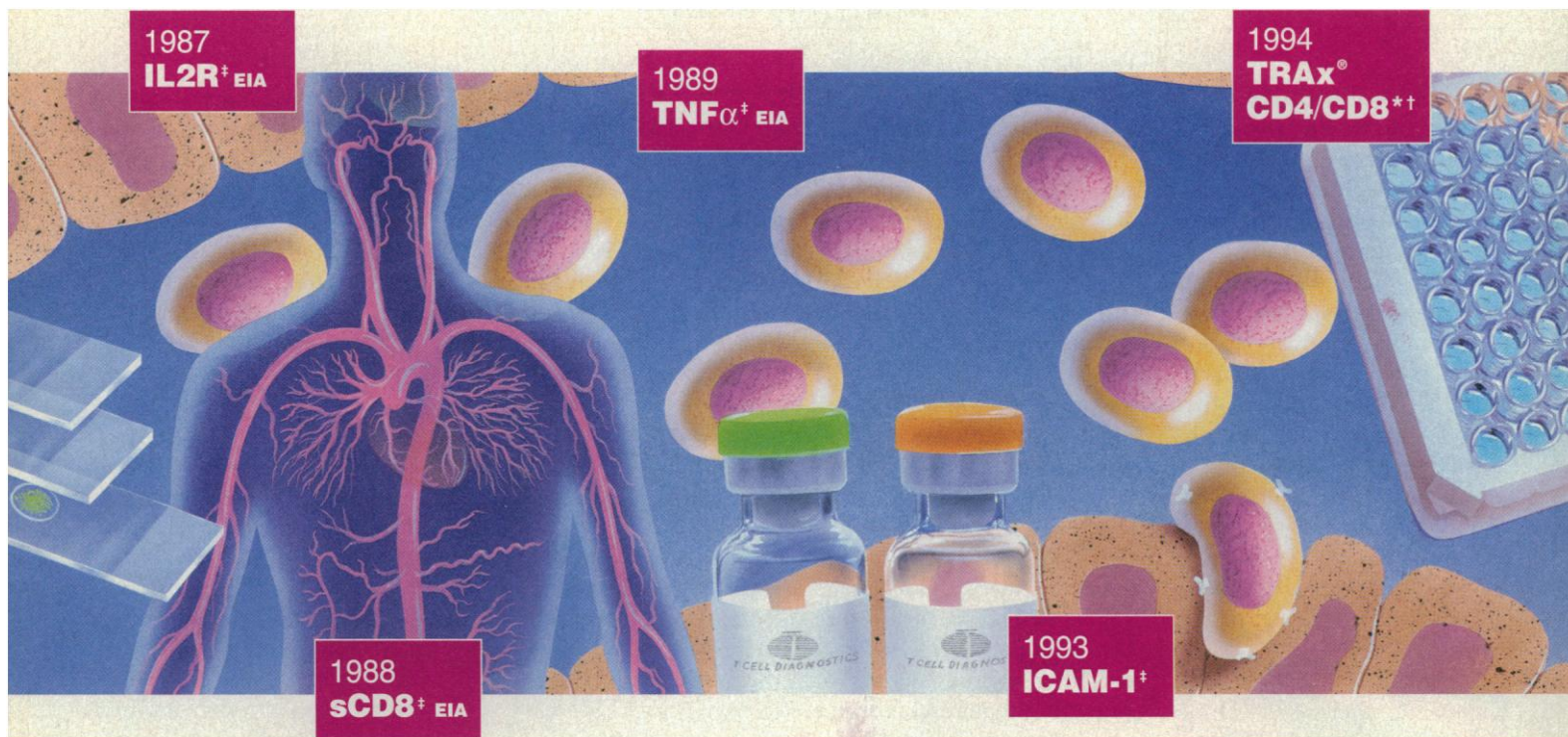
To understand how integrin receptors not only mediate transmembrane signal transduction but also play a role in cell adhesion and cytoskeletal organization, Miyamoto *et al.* (p. 883) investigated the response of receptors to monovalent and multivalent ligands, as well as to a noninhibitory antibody that simply aggregated receptors. Occupancy of the receptors by monovalent ligands and clustering by the antibodies produced different responses, and the full repertoire of integrin functioning was induced only when the multivalent ligands both occupied the receptor sites and aggregated the receptor.

## Homing signals

Developing commissural axons that grow in the spinal cord are guided to their correct locations in part by the influence of chemoattractants from the neuroepithelial cells of the floor plate. De Felipe *et al.* (p. 899) provide evidence suggesting that migrating neurons produce the neuropeptide substance P, which can bind to receptors on the floor plate cells and enhance the release of chemoattractants. Thus, the migrating neurons themselves appear to provide cues to the floor plate cells, thereby amplifying the chemoattractive signals that guide them.



**CYTOKINES ■ ADHESION MARKERS ■ T CELL RECEPTORS ■ SOLUBLE RECEPTORS**



## T Cell Diagnostics Puts a Decade of Immunology Research in Your Hands.

***The path your research takes is often dictated by the resources at hand. For 10 years, T Cell Diagnostics and our parent company, T Cell Sciences, have developed tools for novel explorations into human immunology.***

### **High-Performance EIA Kits Lead the Way**

Accurately quantitate cytokines and soluble receptors with our complete line of high-sensitivity, high-specificity immunoassay kits. Calibrated standards and easy-to-follow protocols ensure reproducible results in a few quick steps.

Obtain absolute CD4 and CD8 lymphocyte counts in your lab without flow cytometry by using the familiar TRAx® ELISA format.

### **High-Quality Mabs for High Specificity**

Precisely identify T cell antigen receptors and adhesion markers by using our broad range of monoclonal antibodies and extensive applications expertise.

### **Measure Immune Profiles for Clinical Research**

With our unique combination of products, you have the capability to study immune status in HIV, infectious disease, and organ transplantation.

### **Complete Support at Your Fingertips**

Our experienced Technical Support Staff and Researchers will work closely with you to realize every advantage that our products bring to your lab.

***Let us put a decade of immunology research in your hands. Call 1-800-624-4021 for our catalog.***



**T CELL DIAGNOSTICS**

**HELPING YOU EXPLORE THE IMMUNE RESPONSE**

T Cell Diagnostics, Inc., 6 Gill Street, Woburn, MA 01801 Tel: 617-937-0890, 1-800-624-4021 \*For Investigational Use Only. Pending FDA clearance. †Patents Pending, T Cell Diagnostics Inc. ‡For Research Use Only.

**Circle No. 47 on Readers' Service Card**

D.C. #564





# Luciferase:

*the next generation.*

**Luciferase**  
Reporter Gene Technology

**Better.**

**Bolder.**

**Brighter.**

Promega Corporation, the leader in luciferase technologies, is pleased to introduce an exciting advance to the firefly luciferase gene in the new pGL3 family of luciferase reporter vectors. Highlights include:

- Cytoplasmic localization of expressed luciferase, providing greater sensitivity through increased *in vitro* and *in vivo* luciferase activity
- Removal of intragenic consensus regulatory elements to minimize potential interferences
- Sequence modifications to enhance translational efficiency
- Increased RNA processing fidelity

Other new additions to our product line include:

- Anti-Luciferase, Affinity Purified for increased specificity and minimal cross reactivity. Performance tested in Immunocytochemistry applications.
- Luciferase Assay System with Reporter Lysis Buffer allows luciferase, CAT, and  $\beta$ -galactosidase assays to be performed on the same cell extract. The system features increased luminescence over conventional methods and a simpler assay procedure.
- New pGL3 Sequencing Primers

For larger volume users, we offer a variety of money-saving bulk systems. We also offer the Turner Designs Model 20 Luminometer.

**Promega—the gold standard in bioluminescence!**

Detection of Luciferase using Promega's Affinity Purified Luciferase Antibody.

Bioluminescence from an adult *Drosophila* expressing luciferase fused to an *hsp70* promoter, imaged using an intensified CCD camera. Photo courtesy of Dr. Steve Kay, NSF Center for Biological Timing.

**For Direct Sales in USA:** Promega Corporation • 2800 Woods Hollow Road • Madison, Wisconsin • 53711-5399 • Toll Free 800-356-9526 • Fax 800-356-1970  
Promega products may also be purchased from Fisher Scientific • Toll Free 800-766-7000 • Fax 800-926-1166

**Branch Offices:** Australia 1 800 225 123 • China 01 256 3159 • France 05 48 79 99 • Netherlands 071 324 244 • Switzerland 01 830 70 37 • United Kingdom 0800 378994

<b>Worldwide Distribution:</b>	Finland 90 708 0900	Indonesia 21 726 0567	New Zealand 9 570 3200	Sweden 0346 83050
Argentina 1 381 7962	France 1 45 33 67 17	Ireland 01 8426644	Norway 035 541999	Taiwan 02 733 6877
Austria 1 80105 324	Germany 06221 502122	Israel 8 406 530	Poland (see Ger. Export)	Thailand 2 284 0950-51
Belgium (see Netherlands)	Ger. Export 49 6221 502 114	Italy 055 5001871	Portugal 1 458 1641	Trinidad & Tobago 809 673 1378
Brazil 031 275 12 40	Greece 01 643 6138	Japan 03 3270 0536	Russia 095 135 4206	Turkey 216 385 8321
Canada 800 267 7424	Hong Kong 2751 9488	Korea 2548 5911 or 02 588 5961	Singapore 273 0898	Uruguay (see Argentina)
Czech Republic 02 361 825	Hungary 01 251 0344	Luxembourg (see Netherlands)	Slovakia (see Czech Republic)	Venezuela 2 265 0891
Denmark 44 94 88 22	Iceland (see Sweden)	Malaysia 3 735 1559	South Africa 11 886 4710	
Egypt 2 245 1785	India 11 684 6565	Mexico 5 525 8579	Spain 93 404 52 14	

©1995, Promega Corporation. All Rights Reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of Promega Corporation. Prices and specifications subject to change without prior notice. Revised 1/3/95

Circle No. 42 on Readers' Service Card



**Promega**

In USA Call

**800-356-9526**

Fax 800-356-1970 or



**Fisher Scientific**  
800-766-7000



# Picture Perfect

**BioMax Film**  
Maximum Performance For Biological Imaging



## KODAK Products and Techware — the perfect match for scientific imaging.



When it comes to your biological imaging and analysis product needs, there's no better choice than KODAK products from Sigma-Aldrich Techware.

A single phone call is all it takes to gain immediate access to the complete KODAK Scientific Imaging Systems product line...as well as over 10,000 other brand name laboratory equipment and supply products.

In addition to a wide selection of top quality laboratory products, Sigma-Aldrich Techware backs each

purchase with unequalled service and support, including:

- Same day shipping
- Comprehensive technical support
- Competitive pricing



If your research calls for biological imaging and analysis products that are picture perfect, choose KODAK products from Sigma-Aldrich Techware—your single, most convenient source for brand name laboratory equipment and supplies.

**SIGMA-ALDRICH**  
*Techware*  
FROM BENCHTOP TO BOOKSHELF

**SIGMA<sup>®</sup>** 

Where Science and Service Come Together.

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. 21 on Readers' Service Card





GUARANTEED OLIGOS™

**CONNECT  
YOURSELF TO OUR  
DNA  
SYNTHESIZERS**



**SEND YOUR SEQUENCES  
BY E-MAIL  
FOR DIRECT  
EXECUTION**

**USA**

**ORDER AT : [oligos@gensetlj.com](mailto:oligos@gensetlj.com)**

For quotation : [marketing@gensetlj.com](mailto:marketing@gensetlj.com)

**EUROPE & ASIA**

**ORDER AT : [oligos@genset.fr](mailto:oligos@genset.fr)**

For quotation : [marketing@genset.fr](mailto:marketing@genset.fr)

Circle No. 35 on Readers' Service Card

# Introducing StatView 4.1 for your Power Macintosh

*Analyzing data the StatView way is faster than ever!*

Are you still trying to wring statistics from a spreadsheet? Or shuttling data back and forth among statistics, graphing, and presentation programs? We have a better way.

## The StatView way

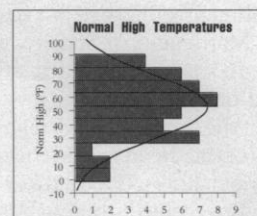
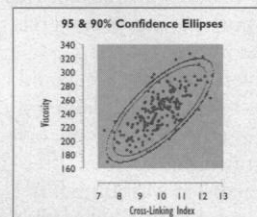
StatView is the best-selling, most award-winning data analysis package for the Macintosh. No other program combines data management, data analysis, graphing, drawing, and color presentation into a single easy-to-use package. If you need to go from raw data to a finished presentation, the easiest way is the StatView way.

## Now 4 to 10 times faster!

StatView is now accelerated for your Power Macintosh. (Of course it runs great on regular Macs, too.) Take advantage of this stellar performance increase — try StatView “native” on your Power Macintosh today. For more information on StatView 4.1, call us at **1-800-666-STAT**

© 1994 Abacus Concepts, Inc., 1918 Bonita Avenue, Berkeley, CA 94704-1014; tel: 510-540-1949; fax: 510-540-0260. StatView is a registered trademark and SuperANOVA is a trademark of Abacus Concepts, Inc. All other brands are property of their respective holders.

StatView —  
now 4 to 10  
times faster  
on your Power  
Macintosh!



**ABACUS**  
**CONCEPTS**  
THE SIGNIFICANT DIFFERENCE™

Circle No. 36 on Readers' Service Card

## FLUORESCENCE POLARIZATION AT LOW COST

**FPM-1™ FPM-1™ SYSTEM  
FLUOROLITE FPM-2™**

- SENSITIVE ■ FAST
- PRECISE ■ EASY

### INSTRUMENTATION FOR PERFORMING

- DNA PROBES
- DNA/PROTEIN BINDING
- CELL RECEPTOR/LIGAND BINDING
- THERAPEUTIC DRUG ANALYSIS
- ENZYME/SUBSTRATE INTERACTIONS
- PROTEASE ASSAYS
- ANTIBODY/ANTIGEN INTERACTIONS
- DRUG/RECEPTOR INTERACTIONS
- HIGH VOLUME THROUGH-PUT SCREENING (FLUOROLITE FPM-2 ONLY)
  - 96 WELL FORMAT
  - >15,000 SAMPLES PER DAY

FOR FURTHER DETAILS CALL, FAX OR WRITE TO  
**JOLLEY CONSULTING AND RESEARCH, INC.**

34469 N. CIRCLE DR., ROUND LAKE, IL 60073 USA  
708-548-2330 ■ USA & CANADA 1-800-685-0401  
■ FAX 708-548-2984



Circle No. 5 on Readers' Service Card



# TRANSGENICS SERVICES



Model Development • Embryo Cryopreservation  
• Rederivation • Animal Husbandry • Animal Surgery  
• Health Monitoring • Genetic Monitoring



**Charles River**  
LABORATORIES

Contributing to the Search for Healthier Lives™

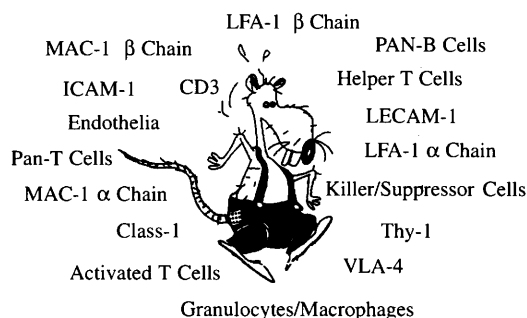
251 Ballardvale Street, Wilmington, MA 01887 1-800-LAB-RATS



© Charles River Laboratories, 1995

Circle No. 28 on Readers' Service Card

## Monoclonal Antibodies to Rat Cell Adhesion



For research use only. Not for drug or other uses.

The purest biochemicals for research in  
• Carbohydrate Chemistry • Molecular Biology  
• Immunology • Cell Biology



**SEIKAGAKU AMERICA, INC.**  
30 West Gude Drive, Suite 260  
Rockville, MD 20850-1161  
Tel. 301-424-0546, 1-800-237-4512  
Fax. 301-424-6961

A subsidiary of SEIKAGAKU CORPORATION Tokyo, Japan

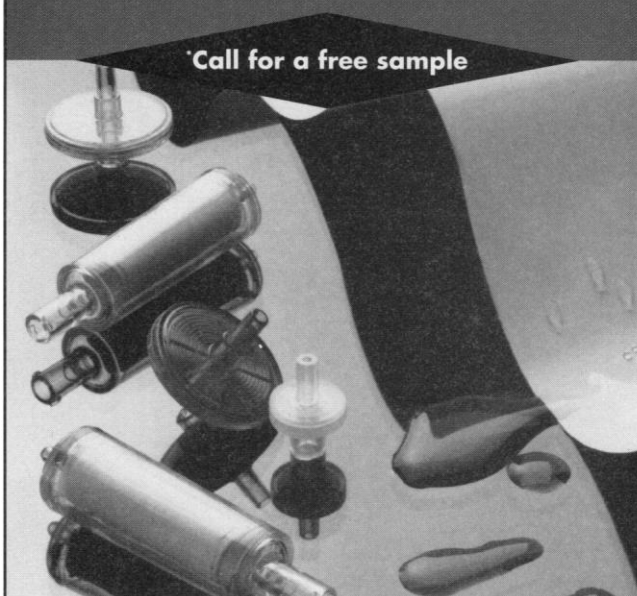
**SEIKAGAKU CORPORATION**  
1-5, Nihonbashi-honcho 2-chome, Chuo-ku  
Tokyo 103, Japan  
Tel. 81-3-3245-1951  
Fax. 81-3-3242-5335

"SEIKAGAKU" means "biochemistry"

Circle No. 31 on Readers' Service Card

## Two Words About Our New Express™ Tissue Culture Filters: Fast. Free.\*

Call for a free sample



Bottom line: If you're not using filters with our new Express membrane inside, you're spending twice the time on tissue culture filtrations.

Call for details and technical notes on the Express membrane in 25mm Millex® syringe filters and Sterivex™ syringe- and pump-driven filters.

In the U.S. and Canada, call us at 1-800-MILLIPORE. In Europe, fax to our Paris office: 33-1-30.12.71.83.

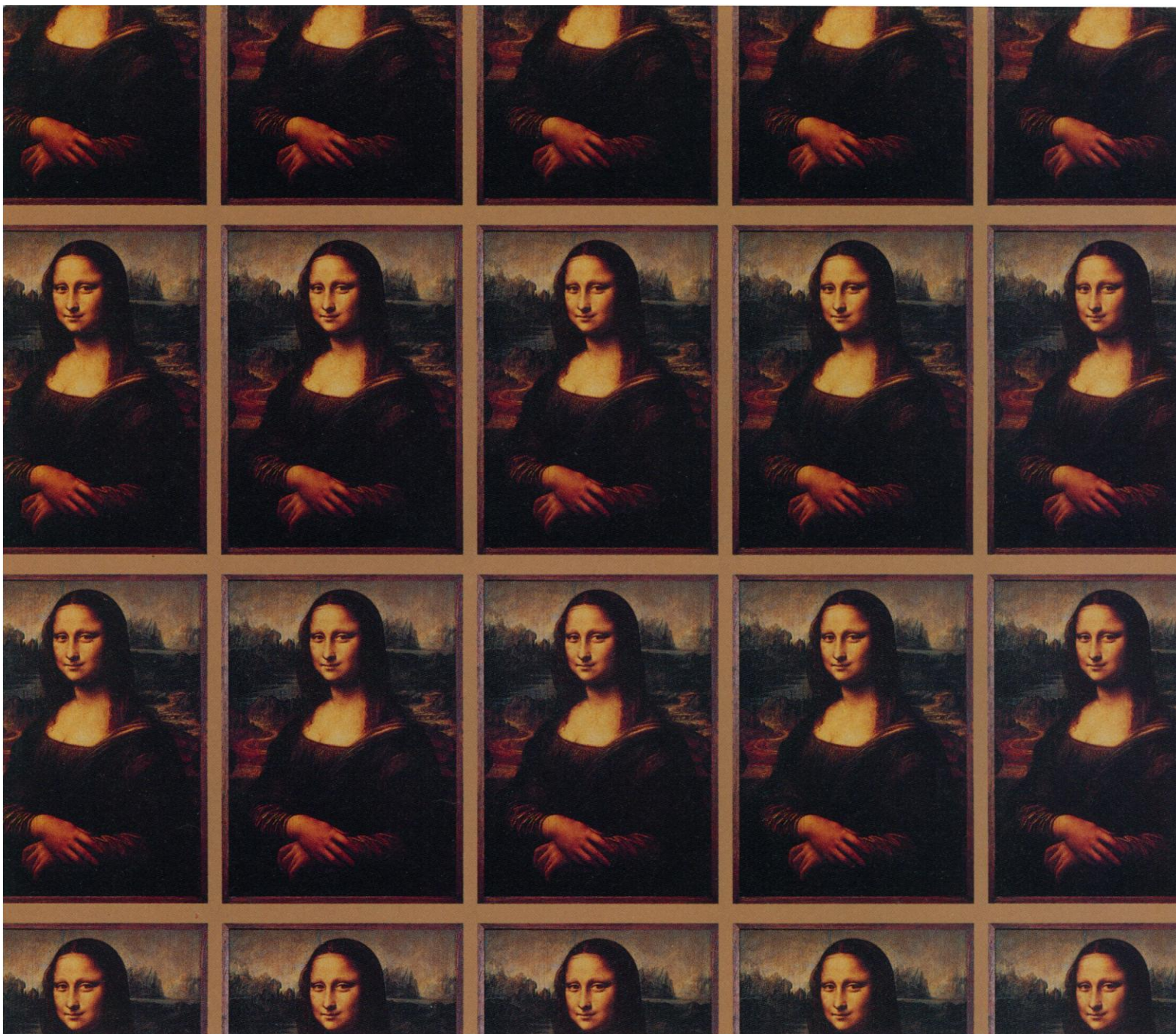
And ask about two other words you'll like: Free sample.

**MILLIPORE**

MILLIPORE LAB CATALOG ON THE INTERNET: ACCESS URL MENU AND  
TYPE: <http://www.millipore.com>

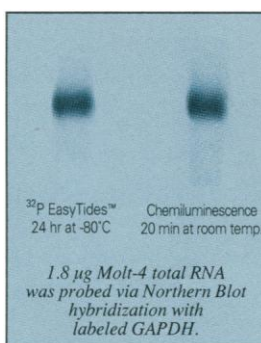
Circle No. 49 on Readers' Service Card





## Smile! Renaissance™ non-rad DNA labeling kits give you reproducible results, not high backgrounds.

Are you repeating experiments just to reduce backgrounds? Then look into Renaissance™ non-radioactive DNA labeling and detection products from DuPont NEN®. And get low backgrounds and reproducible results the first time, and every time.



- Sensitive HRP-luminol systems for colony plaque lifts and Northern, Southern, and Western blots.
- Results in minutes.
- Guaranteed one-year shelf life.
- Backed by full protocol and comprehensive technical service.
- Now available: Random Primer Fluorescein dUTP Labeling Kit and Oligonucleotide 3' End Labeling kit (Fluorescein ddUTP).

DuPont gives you a choice of radioactive and now Renaissance non-radioactive labeling and detection products. For information, or orders call 1-800-551-2121. For information by fax, call 1-800-666-6527 and request number 9002.

All DuPont products are manufactured under an ISO 9001 quality system registered by UL and approved by BSI.

**United States 1-800-551-2121** • Canada 1-800-387-8391 • Australia +61 (008) 257149 • Belgium +32 (02) 7242717  
Denmark +45 31506610 • France (01) 6982 5450 • Germany +49-6172-872600 • Italy (02) 25302 481/483  
Japan +81 (03) 5421-1354 • Latin America/Asia Pacific Fax +1 (617) 426-2464 • Netherlands +31 (073) 206550  
Sweden +46 (08) 7503700 • Switzerland +41 (01) 8410330 • United Kingdom +44 (0438) 724037



DuPont NEN®



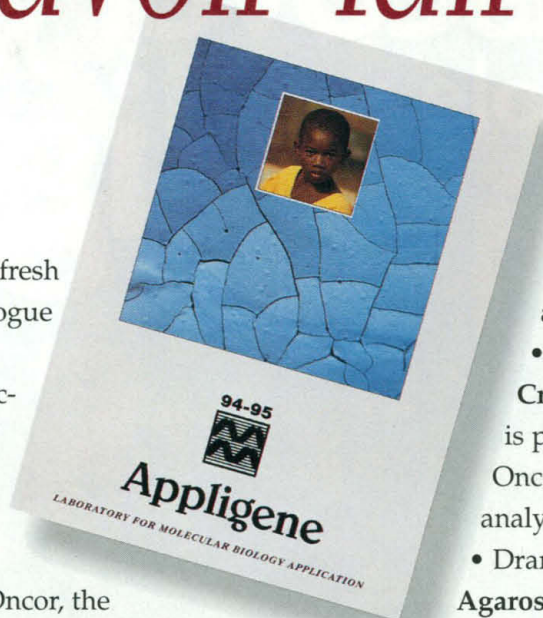
A New Breed of  
Molecular Biology Products

# Get this catalogue and increase your molecular biology *savoir-faire.*

Here's informative reading fresh from France: an exciting catalogue of innovative instruments, systems and reagents manufactured by Appligene, one of Europe's leading molecular biology companies.

These products are now marketed and supported by Oncor, the leading developer of products for genetic analysis, among them the breakthrough **ApopTag™ In Situ** Apoptosis Detection Kit.

- **Penetratin™ 1**, a patented 16 amino acid peptide, delivers DNA and peptides directly to the cell nucleus and is the newest Appligene Oncor



tool for gene targeting and antisense research.

- The versatile, oil-free

**Crocodile III** temperature cycler is part of a full line of Appligene Oncor instrumentation for DNA analysis.

- Dramatically clear **Infinity™**

**Agarose Enhancer** is among many Appligene Oncor products for DNA isolation, electrophoresis and blotting.

**Be savvy. Call us for a catalogue now.**

**We'll get it to you *tout de suite.***

**oncor®**

For Research Use Only. Not for use in diagnostic procedures.  
Penetratin™ is a trademark of Appligene. Infinity™ and ApopTag™ are trademarks of Oncor, Inc.

209 Perry Parkway 1-800-77-ONCOR  
Gaithersburg, 301-963-3500  
MD 20877 Fax: 301-926-6129

Circle No. 24 on Readers' Service Card





SciFinder™

See .  
scientific  
discovery  
in a whole new light.



# SciFinder from CAS.<sup>®</sup>

## A desktop research tool so illuminating, it will make you feel like you've been working in the dark.

Imagine a tool that provides the answers you need, right at your desktop. A tool that informs you and inspires you, making you — and your organization — more efficient and more effective than ever before.

That is the power of SciFinder, a content-based software tool from CAS that offers you:

- **Desktop capability.** With SciFinder, your Macintosh<sup>®</sup> or Windows desktop computer system provides immediate answers to routine research questions.
- **A direct link to a wealth of worldwide information.** SciFinder connects you with the CAS REGISTRY<sup>SM</sup> of 13 million chemical substances and the CA databases, which reference more than 11 million articles and patents from 1967 to the present.
- **Point-and-click access.** Interacting with SciFinder is almost like having a conversation. Its intuitive graphical interface guides you through each step, allowing you point-and-click access to routine answers.

For nearly 90 years, CAS has provided chemical researchers the pathways to knowledge. Now, even as the universe of available information expands, the pathways are easier than ever to follow.

For more details on SciFinder, call **1-800-753-4227** or **614-447-3731** for our brochure.

*SciFinder gives you three pathways to knowledge — right at your desktop:*

### EXPLORE

SciFinder lets you explore the CAS REGISTRY and the CA databases — by author, research topic, or chemical substance.



### BROWSE

With SciFinder, you can easily browse the Tables of Contents of more than 1,300 scientific journals.



### KEEP ME POSTED

To keep up with the latest developments in areas of interest, just define key words, authors, and CAS Registry Numbers<sup>®</sup> that are important to you, and SciFinder will "keep you posted."



A division of the American Chemical Society<sup>®</sup>  
SciFinder is a trademark of the American Chemical Society<sup>®</sup>  
Macintosh is a registered trademark of Apple Computer, Inc.

Outside the U.S.,  
call CAS toll-free:  
U.K. and N. Ireland  
0800-89-6626  
Republic of Ireland  
800-55-7560  
France  
05-90-10-63  
Germany  
0130-8-16862  
Switzerland  
155-0445



# Announcing...

## **NO ANNUAL FEE and a Special 9.9%<sup>†</sup> 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: **NJBD**

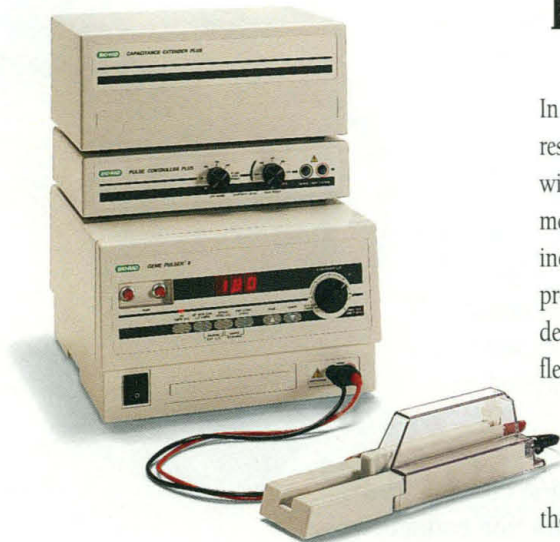
<sup>†</sup>The Annual Percentage Rate (APR) for purchases is 16.4%, which may vary. The APR is 9.9% on cash advances through your first six statement closing dates commencing on the month after your account is opened and may vary thereafter (applies to both new and outstanding cash advance balances). 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.



# PulseTrac

## With **PulseTrac** Delivery the Gene Pulser® II System offers Unprecedented Electroporation Performance



In electroporation, precise pulse delivery is essential for reproducible results. The Gene Pulser II system provides maximum reproducibility with **PulseTrac**, an exclusive pulse delivery feature. **PulseTrac** monitors and compensates for subtle variations in the pulse circuit, including minute sample-to-sample differences, for unparalleled precision. The Gene Pulser II system retains the proven modular design of the original Gene Pulser system. This ensures maximum flexibility and accommodates future upgrades. Each module provides the greatest power and range of appropriate settings for optimizing a specific application. The result is unprecedented electroporation performance. To find out how **PulseTrac** and the Gene Pulser II system can deliver for you, call 1-800-4BIORAD or your local Bio-Rad representative today.

**BIO-RAD**

Bio-Rad  
Laboratories

Life Science Group






























US (800) 4BIORAD • AU 02-805-5000 • AT (1)-877 89 01 • BE 09-385 55 11 • CA (905) 712-2771 • CN (01) 2051873 • FR (1) 49 60 68 34 • DE 089 31884-0 • IT 02-21609 1 • JP 03-3534-7665 • HK 7893300 • NL 08385-40666 • NZ 09-443 3099 • SG (65) 443 2529 • ES (91) 661 70 85 • SE 46 (0) 8-735 83 00 • CH 01-810 16 77 • GB 0800 181134

SIG 071494

Circle No. 23 on Readers' Service Card



# Our Competitors' Enzymes Can't Pass The Quality Testing Performed On GIBCO BRL Restriction Endonucleases<sup>†</sup>

Assay Performed	GIBCO BRL	Company A	Company B	Company C
DNA Endonuclease Assay	All Pass	 	All Pass	
DNA Exonuclease Assay	All Pass	All Pass	 	
DNA Ligation/Recut Assay	All Pass	 	 	All Pass
Nicking Assay	All Pass		 	 
Unit Assay	All Pass	    	   	   
 = One Failure <p><b>Summary: Seven out of ten restriction endonucleases from each competitor failed one or more of our quality tests.</b></p>				

<sup>†</sup>Enzymes tested in the manufacturers' recommended buffers: *Bam*H I, *Bgl* I, *Cla* I, *Eco*R I, *Hind* III, *Kpn* I, *Not* I, *Pst* I, *Sal* I, and *Sst* I (*Sac* I)

In a recent quality comparison between Life Technologies and three leading manufacturers, seven out of ten restriction endonucleases from each competitor failed one or more of our quality tests.

Life Technologies offers the highest quality restriction endonucleases on the market because of our system of rigorous and complete quality control. All assays are performed at four separate stages: before and after the purification process, on the undiluted product, and on the diluted product.

For reliable, consistent results, choose GIBCO BRL restriction endonucleases to beat the competition. Now for our free restriction endonuclease brochure or for a summary of the comparative data.

To Order/TECH-LINE<sup>SM</sup>: (800) 828-6686

LIFE  TECHNOLOGIES<sup>TM</sup>

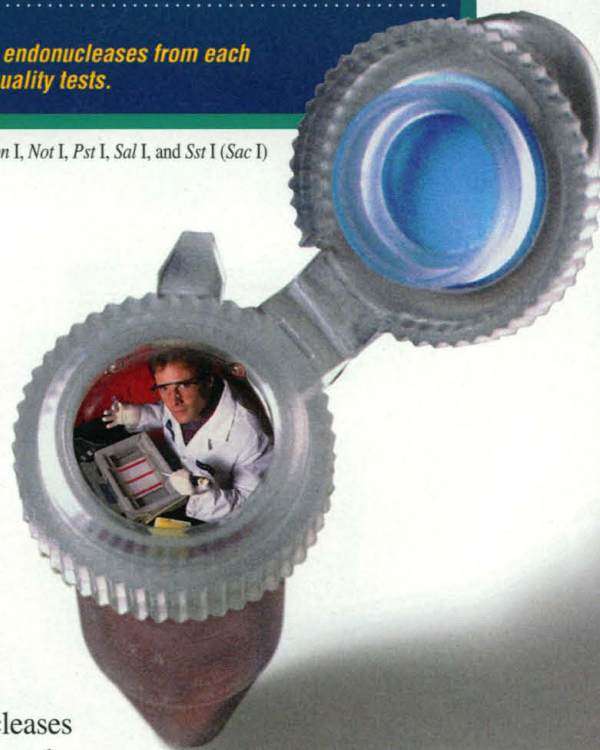
**U.S.A. Orders**  
P.O. Box 68  
Grand Island, NY 14072-0068 U.S.A.  
Facsimile: (800) 331-2286  
To Order/TECH-LINE: (800) 828-6686

**Canada Orders**  
Burlington, Ontario L7P 1A1 Canada  
To Order: (905) 335-2255  
TECH-LINE: (800) 757-8257

**U.S.A. Office for Latin America**  
To Order/TECH-LINE: (301) 840-4027  
Facsimile: (301) 258-8238

TECH-LINE<sup>SM</sup> and the Life Technologies logo are marks of Life Technologies, Inc. For research use only. Not intended for human or animal diagnostic or therapeutic use.  
95-003

Circle No. 29 on Readers' Service Card





# Don't let small sample dialysis get out of hand.

Take control with the new Pierce Slide-A-Lyzer™ Dialysis Cassettes!

Load a sample for dialysis easier and faster than ever with this revolutionary new system. The new Pierce Slide-A-Lyzer™

Dialysis Cassette replaces the mess and hassles of conventional tubing with a more convenient, more effective approach.



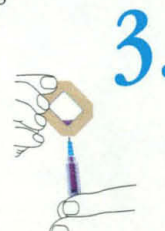
No more boiling, soaking, tying, or clamping - all you need is a syringe to load and remove your sample from these ready-to-use, disposable cassettes. The

exclusive cassette design gives you total sample control, good surface-to-volume ratio and consistently reliable sample recovery. For even

greater convenience, use the accessory Buoys to float your sample during dialysis, and as a bench-top cassette stand during loading and recovery.



Pierce Slide-A-Lyzer™ Cassettes have a 0.5 - 3.0 ml sample capacity, 10,000 molecular weight cut-off, and are ideal for routine dialysis of protein, nucleic acid and carbohydrate samples.



Product #	Description	U.S. Price
66425	Slide-A-Lyzer™ 10K Dialysis Cassettes*, 10 pack Contains: 10 cassettes (10,000 Molecular Weight Cut-off, 0.5 - 3.0 ml sample capacity)	\$49
66430	Slide-A-Lyzer™ Buoys, 10 pack	\$12
66490	Slide-A-Lyzer™ Syringe and 18G Needle Accessories, 10 pack Contains: 10 each of 5 cc single-use, sterile, polypropylene syringes with Luer-Lok® tips and single-use, sterile, 18-gauge, 1" needles compatible for use with the Slide-A-Lyzer™ Dialysis Cassette. Ideal for nucleic acid applications.	\$9



Call for your FREE copy of Pierce's Life Science & Analytical Research Products or Molecular Biology Catalog!

To order in the U.S.A.: Pierce • 3747 N. Meridian Rd. • P.O. Box 117 • Rockford, IL 61105 • Telephone: 800.874.3723 FAX: 800.842.5007

European Office: Pierce Europe B.V. • P.O. Box 1512 • 3260 BA Oud Beijerland • The Netherlands • Telephone: 31.1860.19277 FAX: 31.1860.19179

European Distributors:

Austria 018891819  
Belgium 036465511

Denmark 44948822

France 070038855

Germany 0224196850

Italy 025097220

Holland 0206113133 or

076795795

Norway 22722100

Spain 017290333

Switzerland 0217287772

United Kingdom 0244382525

Sweden 087460035

**PIERCE**

a Perstorp Biotec Company

Outside Europe and the U.S., contact Pierce U.S. for your local Pierce distributor. Telephone: 815.968.0747 FAX: 815.968.8148

© Pierce Chemical Company, 1994. \* Patent Pending

Circle No. 8 on Readers' Service Card



**T**he latest edition of the New England Biolabs catalog provides a host of new features and is an easy-to-use reference guide. Pick up your copy and catch the wave of new products on the rise:

- **171 Restriction Endonucleases** including 12 new and over 80 recombinant enzymes
- **Recombinant Fse I:** an 8-base cutter, GGCCGG/CC
- **9°N<sub>m</sub> DNA Polymerase:** A recombinant thermostable DNA Polymerase with a reduced level of 3' → 5' exonuclease activity
- **Klenow Fragment (3 → 5 exo<sup>-</sup>):** for dideoxy sequencing and random primer labeling
- **LITMUS™ multipurpose cloning vectors**
- **An expanded line of Protein Modification Products** including endo- and exoglycosidases, protein kinases, protein phosphatases, inhibitors and substrates, and protein molecular weight markers
- **Code20™ Cassette Mutagenesis Kit** for inserting or substituting all single 20 amino acid codons at specific sites in DNA
- **polyA Spin™ mRNA Isolation Kit** for the isolation of full-length poly(A)<sup>+</sup> eukaryotic mRNA using spin columns pre-packed with microcrystalline oligo(dT) cellulose

*Call New England Biolabs to be sure you have your very own copy.*

# NEW PRODUCTS ON THE RISE

*New England Biolabs 1995 Catalog*

- **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) 95 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. 46 on Readers' Service Card



*20 years and beyond...*



New E-Z HOLD™ Plastic Bottle for GIBCO BRL Media, Sera, & Reagents

# E-Z to Hold, Hard to Break.

## Specially Designed for Cell Culture

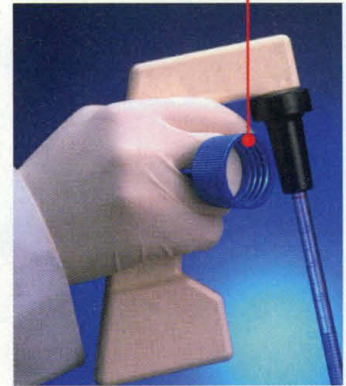
E-Z HOLD Bottles are **easy** to use with no-drip spout, wide mouth design, and visible graduations. Overall round shape allows **easy** swirling. Patented\* cap is **easy** to hold while performing aseptic procedures.

## No-Slip Grip

Flat sides make these bottles **easy** to hold, even when handling wet bottles while wearing gloves.

## Virtually Unbreakable

It's **easy** to be safe with E-Z HOLD Bottles made from tough, yet lightweight, polyethylene terephthalate (PET) plastic. And, PET plastic is the most recycled plastic in the world. ♻



## Room for Supplementation

Extra headspace for **easy** supplementation of at least 20% over normal fill volumes.

## GIBCO BRL Quality

It's **easy** to see that the best thing about the E-Z HOLD Bottles is what comes in them: time-tested GIBCO BRL media, sera, and reagents. Extensive testing has proven that you can count on E-Z HOLD Bottles to protect these quality products.

For more information, please call our TECH-LINE<sup>SM</sup> at (800) 828-6686, ext. 6890.



**LIFE TECHNOLOGIES™**

Producer of GIBCO BRL Products

### U.S.A. Orders

Facsimile: (800) 331-2286  
To Order/TECH-LINE: (800) 828-6686

### Latin America Orders

To Order/TECH-LINE: (301) 840-4027  
Facsimile: (301) 258-8238

### Canada Orders

To Order: (905) 335-2255  
TECH-LINE: (800) 757-8257  
Facsimile: (800) 387-1007

E-Z HOLD™, TECH-LINE<sup>SM</sup>, and the Life Technologies logo are marks of Life Technologies, Inc.

94-110

\* Patent No. 5,246,127

Circle No. 44 on Readers' Service Card



# Maximum Detection for Cytokines and Growth Factors

*Intergen Antibodies Guarantee a Higher Degree of Specificity*

## High Quality/Maximum Reproducibility

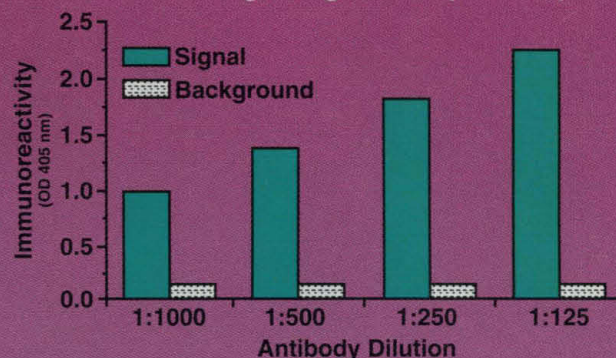
Intergen's unique immunization procedure utilizing proprietary high purity recombinant antigens produces the highest quality antibodies with maximum reproducibility.

## Reduced Nonspecific Binding

Intergen's unique purification process prevents damage to the FC region and reduces nonspecific binding as well as stickiness.

## No Cross Reactivity

Intergen performs extensive EIA testing to ensure no cross reactivity. Western Blot demonstrates high degree of specificity.



## Precise Matched Pairs

Neutralizing antibodies produced to Intergen human and murine cytokines and growth factors. Complement antigens available for precise matched pairs.

**Ensure Maximum Detectability\* for Immunocytochemistry and ELISA – Call 1-800-431-4505:**

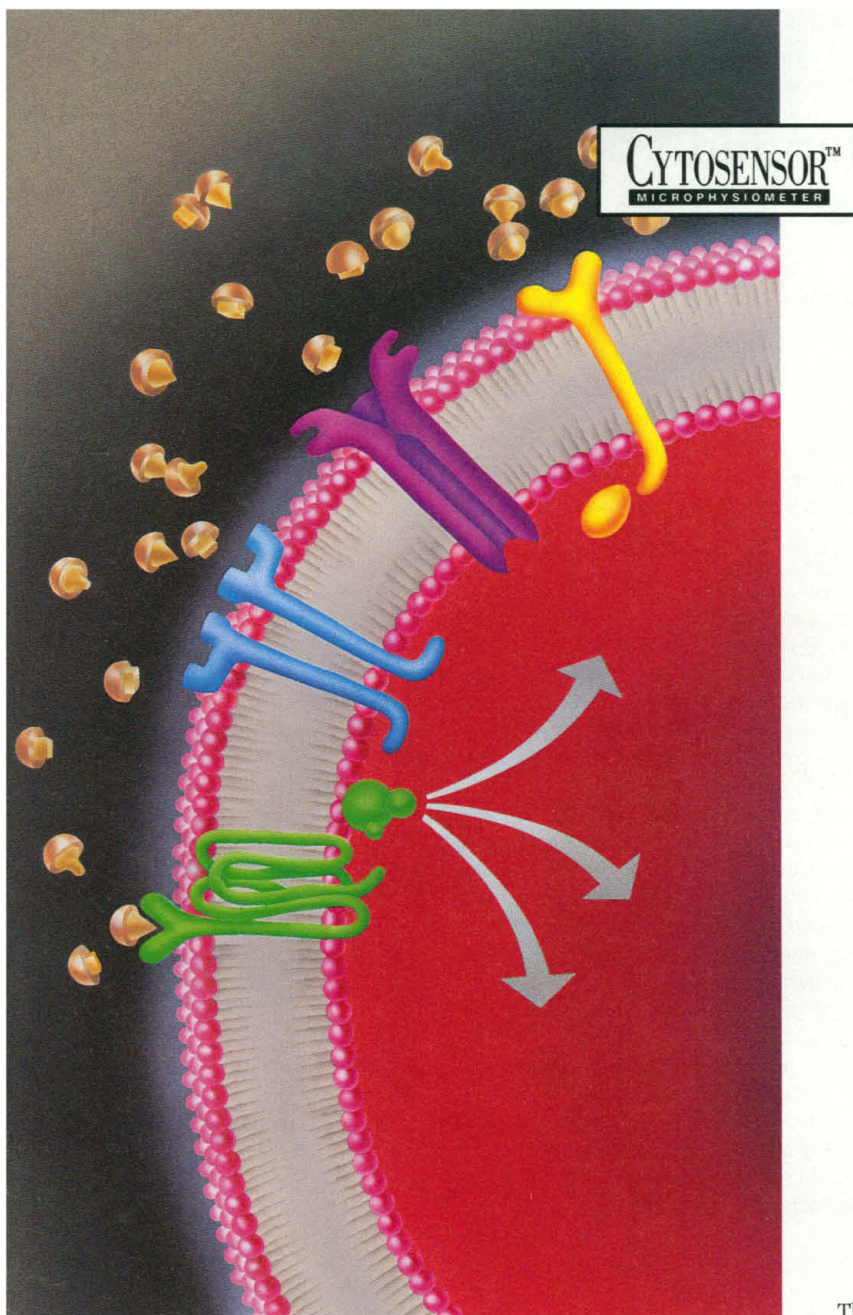


**INTERGEN<sup>®</sup>**  
C O M P A N Y

The Centre at Purchase  
Two Manhattanville Road  
Purchase, NY 10577

\*For research use only – Not to be used as a diagnostic  
Circle No. 25 on Readers' Service Card

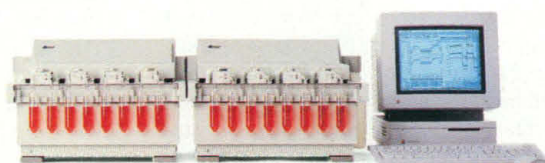




# The Only Comprehensive Assay System for Receptor Signaling.

.....

## THE CYTOSENSOR SYSTEM: FUNCTIONAL RESPONSES IN MINUTES



The **Cytosensor Microphysiometer System** is the latest tool used for drug discovery and signal transduction research<sup>1</sup>. Using a patented biosensor, the system can monitor the receptor-mediated responses from living cells in minutes, producing functional dose responses in just a few hours. Because of the unique biosensor, receptor activation can be studied even without previous knowledge of the signal transduction pathway. Thus, a single assay system can be used to evaluate a variety of receptor families. Previously time-consuming experiments can be performed quickly and easily, making it possible to obtain  $EC_{50}$  and  $IC_{50}$  values in just 4-7 hours<sup>2</sup>, without radioactivity. And novel receptor responses, not seen with other methods, have been observed.

1. *Science* 257, 1906-1912, (1992)

2. *J. NIH Research* 5, 69, (1993)

**Call us for an evaluation of your cells and effector agents or for a detailed list of scientific references.**



**G PROTEIN-LINKED RECEPTORS**



**TYROSINE KINASE RECEPTORS**



**LIGAND-GATED ION CHANNELS**



**HEMATOPOIETIC RECEPTORS**

Circle No. 30 on Readers' Service Card



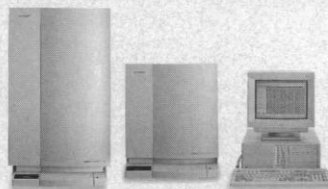
U.S.A. 1-800-400-9060 (FAX: 415-326-5134)

Germany: 49-898-54-5050 (FAX: 49-898-54-2238)

United Kingdom: 44-293-619579 (FAX: 44-293-619586)



## MULTIPLE CHOICE for DNA Sequencing & Genetic Analysis



- ✓ **4000LS LONG READIR™**
  - 800-1000 bases per sample (typical for ss templates).
  - Multitasking software — operate three sequencers on one computer.
- ✓ **4000S**
  - 550 bases per sample with 99% accuracy (typical for ss templates).
  - High sequencing throughput on shorter fragments.
- ✓ **4000LX**
  - Combines a Model 4000L, a Model 4000 and one computer.
  - Each sequencer is operated independently.

Choose a LI-COR *infrared* sequencer for high productivity sequencing, genetic analysis, or extra long reads to close gaps between contigs. Or, combine a system for all three applications!

**1-800-645-4267**

(Toll-Free U.S. & Canada)

**LI-COR®**  
BIOTECHNOLOGY DIVISION

402-467-0700 • FAX: 402-467-0819

4421 Superior Street • P.O. Box 4000 • Lincoln, Nebraska 68504 USA

Circle No. 22 on Readers' Service Card

## Celebrate 150 years of Scientific Advancement

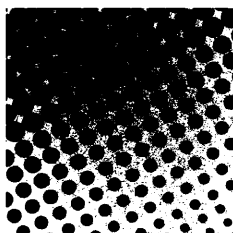
In 1998, the American Association for the Advancement of Science (AAAS) will celebrate the 150th anniversary of its founding. A commemorative postage stamp would be a fitting tribute to the Association's historic efforts to promote the progress of science and engineering in the service of humankind.

**BUT YOUR HELP IS ESSENTIAL.**

We need letters expressing support for a AAAS commemorative stamp as well as ideas for the stamp's theme and design.

Please write promptly to:

The AAAS Commemorative Postage Stamp Committee  
Office of Communications, Room 801  
1333 H Street, NW, Washington, DC 20005  
or call: 202-326-6440



## MOLECULAR RESEARCH CENTER, INC.

*Introduces a splendid isolation for life science and clinical research*

# TRI REAGENT®

*The most capable reagent in molecular biology  
simultaneously isolates total RNA, poly A<sup>+</sup> RNA, DNA and Proteins\*.*

The simultaneous isolation of RNA, DNA and proteins from the same sample by TRI REAGENT is the newest version of the single-step liquid-phase separation method (P. Chomczynski, *Biotechniques*, Vol. 15, 532 1993). This highly reliable method performs well with small and large quantities of tissues or cultured cells, and allows simultaneous processing of a large number of samples of human, animal, plant, yeast, bacterial and viral origin. For the isolation of RNA, DNA and proteins from liquid samples such as whole blood, serum and CSF we offer TRI REAGENT BD and TRI REAGENT LS.

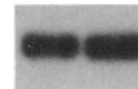
- **Total RNA** is isolated in 1 hour and is ready for Northern (See Figure) and dot blotting, RT-PCR (Hoffmann LaRoche Corp. patent), RNase protection assay and molecular cloning. 1ml of the reagent isolates 50-200 µg of total RNA.
- **Poly A<sup>+</sup> RNA** is isolated in 1.5 hours by application of the aqueous phase containing total RNA on the oligo dT-cellulose column.
- **High molecular weight DNA** is isolated in 3 hours and is ready for restriction analysis, Southern (See Figure) and dot blotting, PCR and molecular cloning.
- **Proteins** are isolated in 3 hours and are ready for Western blotting (See Figure).

For a limited time, take advantage of the 20% introductory discount offer for 50ml TRI REAGENTS (U.S. and Canada only). We guarantee that TRI REAGENT will outperform RNA, poly A<sup>+</sup> RNA, and DNA isolation methods currently used in your laboratory. For more information or to place an order call **800-462-9868, 513-841-0900**, or contact us by Fax **513-841-0080**. \* U.S. Patent

**MRC**

MOLECULAR RESEARCH CENTER, INC.  
5645 Montgomery Rd.  
Cincinnati, OH 45212

Northern blot of rat  
growth hormone  
(rGH) mRNA (1 kb)



Southern blot of EcoR1  
rGH gene fragment  
(11.4 kb)



Western blot of rGH  
(22 kD)



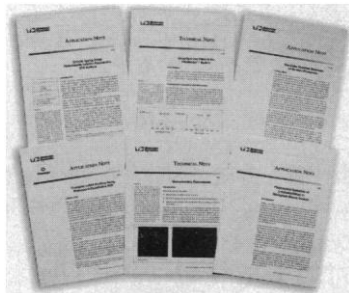
**AUSTRALIA:** A.G.P. Technologies Pty Ltd 61-7-3419702 Fax 61-7-8413422; **FRANCE:** Euromedex 33-88-180722 Fax 33-88-180725; **GERMANY:** BioTech Trade & Service GmbH 49-6227-51308 Fax 49-6227-53694; **INDIA:** Lab Care Products 91-11-6425156 Fax 91-11-6425156; **ISRAEL:** Tal Ron 972-8-472563 Fax 972-8-471156; **ITALY:** Bio-Optica Milano SpA 39-2-2640274 Fax 39-2-2153000; **KOREA:** Choong Il Chemical, Inc. 822-2946411 Fax 822-2936556; **MALAYSIA:** Technicvest Sdn. Bhd 603-6320998 Fax 603-632-0994; **SWITZERLAND:** Lucerna Chem Ag 41-41-369636 Fax 41-41-369656; **TAIWAN:** Pan Asia Biomedical Technology, Inc. 886-2-7418169 Fax 886-2-7764372; **UNITED KINGDOM:** Molecular Research Centre Oxford 44-993-706736 Fax 44-865-351511.

Circle No. 4 on Readers' Service Card



# USE Fluorescence

FOR GELS, BLOTS, TLC & MICROPLATES



## CALL FOR THESE FREE PUBLICATIONS

### TECHNICAL NOTES

Understanding Fluorescence #TN57

Using Dyes and Filters in the Fluorimager System #TN58

### APPLICATION NOTES

Two-Color Mutation Detection in 96-Well Microplates #AN54

Genetic Typing Using Fluorescently-Labeled Polymorphic STR Markers #AN55

Oncogene mRNA Profiling Using Fluorescent Quantitative PCR #AN56

Fluorescent Detection of Beta-Galactosidase in Microplate-Based Assays #AN57

**1.800.333.5703**

In France, call (33) 1 60 86 65 13. In Germany (49) 2151 83870.

In the U.K., and other European countries (44) 1494 793577.

In Japan, call (03) 3976-9692. In Australia (03) 810 9572.



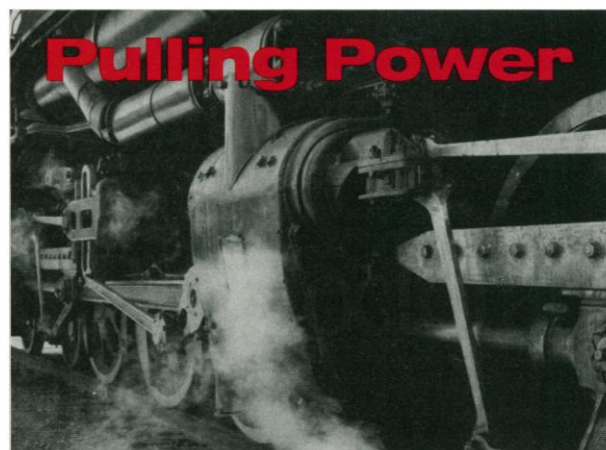
Innovative Instrument Systems for the Life Sciences

928 East Arques Avenue

Sunnyvale, California 94086-4520 USA  
Tel: 408-773-1222 Fax: 408-773-1493

©1994, Molecular Dynamics. All rights reserved. Fluorimager is a trademark of Molecular Dynamics. All other brand and product names are trademarks, service marks, registered trademarks or registered service marks of their respective holders. Product specifications subject to change without notice. All 9/94.

Circle No. 37 on Readers' Service Card



...with this  
much control



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

Circle No. 19 on Readers' Service Card

Sutter micropipette pullers are the finest available.

Built-in versatility and repeatability are based on 20 years of continuous research and development.

Call or write for a free catalog.



**Sutter**

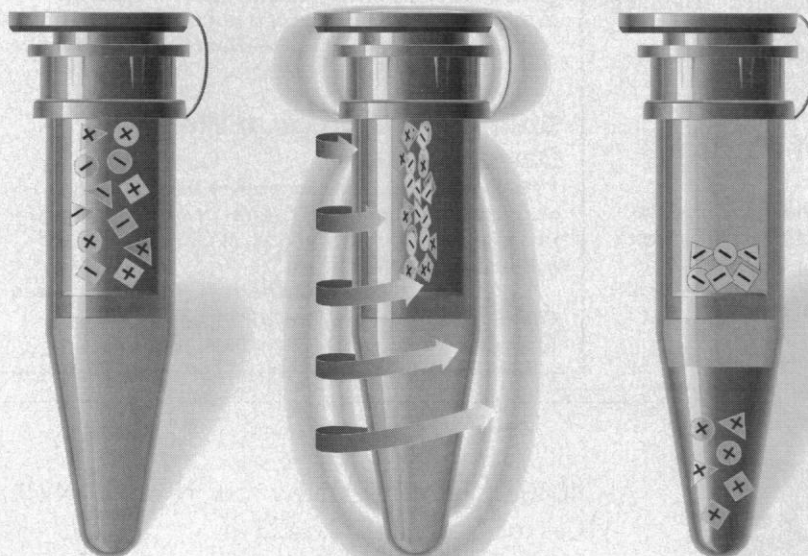
Instrument Company

40 Leveroni Court

Novato CA 94949

## A New Spin On DEAE-Based Separations.

# The Power Of DEAE. With A Twist.



Now you can achieve, on a microscale level, very fine separations of complex protein mixtures—fast. Introducing the Ultrafree®-MC DEAE centrifugal filter from Millipore. The only device that gives you the speed and ease of centrifugal filtration and the selectivity of an anion-exchange chromatography membrane.

How about a test spin? Call us for a free sample. US and Canada, 1-800-MILLIPORE ext. 8017. Japan, fax to (03) 3474-9141. Europe (fax to our Paris headquarters), +33.1.30.12.71.83.

**MILLIPORE**

Internet Lab Catalogue: access URL menu, type: <http://www.millipore.com>

© 1994 Millipore Corporation

Circle No. 48 on Readers' Service Card



# Cambridge—Bringing You the Hottest Topics in Science

New edition...

## Statistical Methods for Biologists

Third Edition

**Norman T. J. Bailey**

Presents the basic concepts of statistics lucidly while recognizing that students must be aware of when to use standard techniques and how to apply the results they obtain. New material includes consideration of pocket electronic calculators and a discussion of problems associated with numerical calculation, electronic calculators, and computers.

1995 269 pp. 47032-3 Hardback \$49.95  
46983-X Paperback \$16.95

## The Ethical Dimensions of the Biological Sciences

**Ruth Ellen Bulger, Elizabeth Heitman, and Stanley Joel Reiser, Editors**

*"...a model of organization and content of a graduate course of ethics in the biological sciences. It is highly recommended not only for the personal library of a scientist or scientist-in-training—but also for use in a graduate ethics course for the biological scientist."*

—**Kenneth Micetich, Doody's Journal**

1993 305 pp. 43463-7 Hardback \$59.95  
43599-4 Paperback \$19.95

## The Correspondence of Charles Darwin

Volume 9: 1861

**Charles Darwin**

**Frederick Burkhardt, Duncan Porter, Janet Browne, and Marsha Richmond, Editors**

Reveals the variety of responses to Darwin's species theory in the second year following the publication of *The Origin of Species*. The letters also yield important new information about contemporary research.

1994 642 pp. 45156-6 Hardback \$59.95

## Theory of Magnetic Recording

**H. Neal Bertram**

Designed to give a fundamental, in-depth understanding of all the essential features of the magnetic recording process for both high density disk and tape recording. The book provides a thorough grounding in four basic areas of magnetic recording: structure and fields of heads and media, the replay process, the recording process, and medium noise analysis.

1994 364 pp. 44512-4 Hardback \$69.95  
44973-1 Paperback \$34.95

## Observational Foundations of Physics

**Sir Alan Cook**

Examines the question of how the ways in which we observe the world determines theories of physics and how we can get reliable results that enable us to make secure predictions. It is argued that the success of prediction is reason for believing in the existence of a world independent of ourselves.

1994 176 pp. 45450-6 Hardback \$39.95  
45597-9 Paperback \$18.95

## Soil Ecology

**Ken Killham**

This integrated approach emphasizes the interrelations among plants, animals and microbes, by first establishing the fundamental physical and chemical properties of the soil habitat and then functionally characterizing the major components of the soil biota and some of their most important interactions.

1994 260 pp. 43517-X Hardback \$64.95  
43521-8 Paperback \$24.95

## Parasite Antigens, Parasite Genes

A Laboratory Manual for Molecular Parasitology

**R. M. Maizels, M. L. Blaxter, B. D. Robertson, and M. E. Selkirk**

Presents methods along with essential explanations and background information to reflect the advent of molecular parasitology. The aim is not only to help the researcher but to invite experienced workers to experiment in areas of unfamiliarity as well.

1992 224 pp. 41927-1 Spiral bound \$59.95

## Introduction to Animal Parasitology

Third Edition

**J. D. Smyth**

The third edition of this basic textbook in parasitology presents students and research workers with a broad multi-disciplined approach to the morphology, ultrastructure, speciation, life cycles, biochemistry, *in vitro* culture, and immunology of parasites.

1995 569 pp. 41770-8 Hardback \$130.00  
42811-4 Paperback \$47.95

Now in paperback...

## Chance and Design

Reminiscences of Science in Peace and War

**Alan Hodgkin**

*"...a gentle glimpse of an earlier English scientific era that required independence and saw great discoveries made with small and frugal methods. It gives unexpected insights into the more private thinking and experience of a scientific giant."*

—**Bertil Hille, Science**

1992 423 pp. 45603-7 Paperback \$29.95

## Spiders in Ecological Webs

**David H. Wise**

*"This timely book appears when there is still a manageable number of studies of spider ecology: in less than 300 pages of text, Wise covers all the major work in depth."*

—**Elizabeth M. Jakob, Science**

**Cambridge Studies in Ecology**

1995 342 pp. 31061-X Paperback \$27.95

Available in bookstores or from

**CAMBRIDGE**  
UNIVERSITY PRESS

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

Call toll-free 800-872-7423

MasterCard/VISA accepted.

Prices subject to change.