

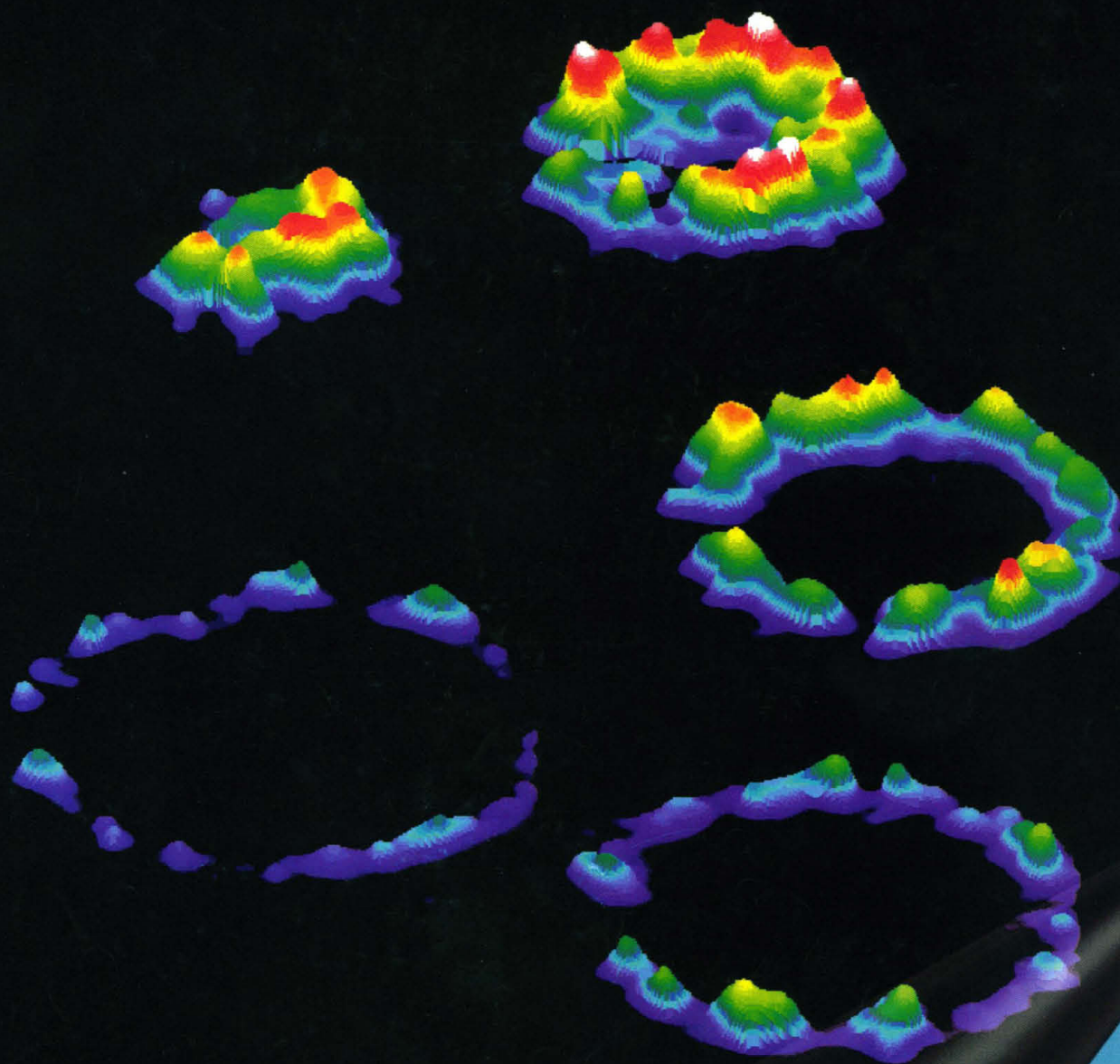


AMERICAN
ASSOCIATION FOR THE
ADVANCEMENT OF
SCIENCE

SCIENCE

7 FEBRUARY 1997
VOL. 275 • PAGES 721-892

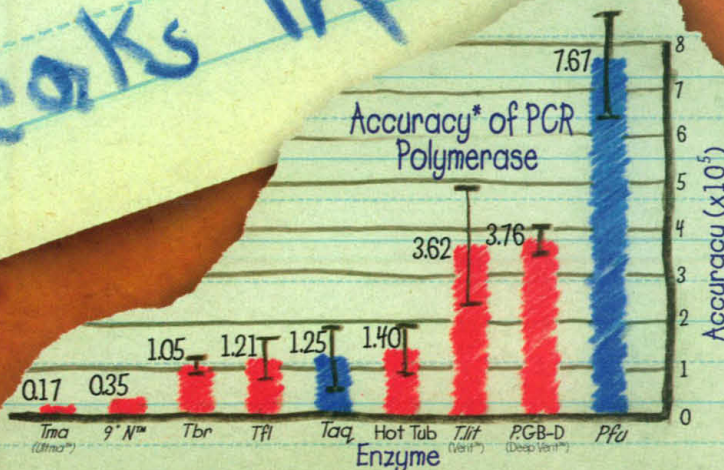
\$7.00



Biotechnology
**Betting on
the Genome**

For High-Fidelity PCR *Pfu* Beats *Taq* Every Time!

If you're using
Tth or *Taq*
for PCR
your DNA
problem has sum
mistakes in it



*Accuracy is represented as the average number of correct nucleotides a given polymerase incorporates before making an error.

UNITED STATES:
Stratagene Headquarters
800-524-5444
INTERNET MAIL:
techservices@stratagene.com
AUSTRALIA: 1800-252-204
AUSTRIA: 1 5332666
BRAZIL: 11 530 7833
CANADA: 905 713 1201
DENMARK: 8 6101055
FRANCE: 1 34 60 2424
GERMANY: 0130-840911
HONG KONG: 5785839
ISRAEL: 3 7521687
ITALY: 258013409
JAPAN: (Toyoko) 3 3660 4819
or 6 348 3785
(Funakoshi) 3 5684 1622
KOREA: 2 5560311
MALAYSIA: 37031888
THE NETHERLANDS: 33 4950094
NEW ZEALAND: 9 443 5867
NORWAY: 22715090
PORTUGAL: 1-4581641
ROC: 2 694 0066 or 2 720 2215
SINGAPORE: 2730988
SPAIN: 1 729 03 33
SWEDEN: 8 680 0945
SWITZERLAND: 3641106
THAILAND: 23080611
UNITED KINGDOM: 0800 585370

† Patent Pending

‡ Purchase of these enzymes is accompanied by a license to use them in the Polymerase Chain Reaction (PCR) process in conjunction with an Authorized Thermal Cycler. Stratagene's PCR products are sold under licensing arrangements with Roche Molecular Systems, Inc., E. Hoffmann-La Roche Ltd. and The Perkin-Elmer Corporation.

Pfu polymerase for accurate PCR!†

Call Stratagene
Or your Stratagene distributor
for the complete picture...

NATIVE *Pfu* DNA POLYMERASE
Catalog #600135 (100U), #600136 (500U)

RECOMBINANT *Pfu* DNA POLYMERASE
Catalog #600153 (100U), #600154 (500U), #600159 (1000)
Circle No. 55 on Readers' Service Card



STATISTICA

Windows 3.1
and WINDOWS 95/NT

STATISTICA (automatically configures itself for Windows 95/NT [long file names, etc.] or 3.1) ■ 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 *AutoTask* 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; correspondence analysis; 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 (professional development environment) with matrix operations, full graphics support, and interface to external programs (DLLs) ■ Batch command language and editable macros, flexible "turn-key" and automation options, custom-designed 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, virtually 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 Industrial System (requires *STATISTICA* or *Quick STATISTICA*) ■ The largest selection of industrial statistics in a single package; quality control charts (real-time data acquisition options), 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 \$995.

STATISTICA/Mac (for Macintosh) ■ Price \$695 (Quick - \$395).

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

STATISTICA has received the highest rating in EVERY comparative review of statistics software in which it was featured, since its first release.



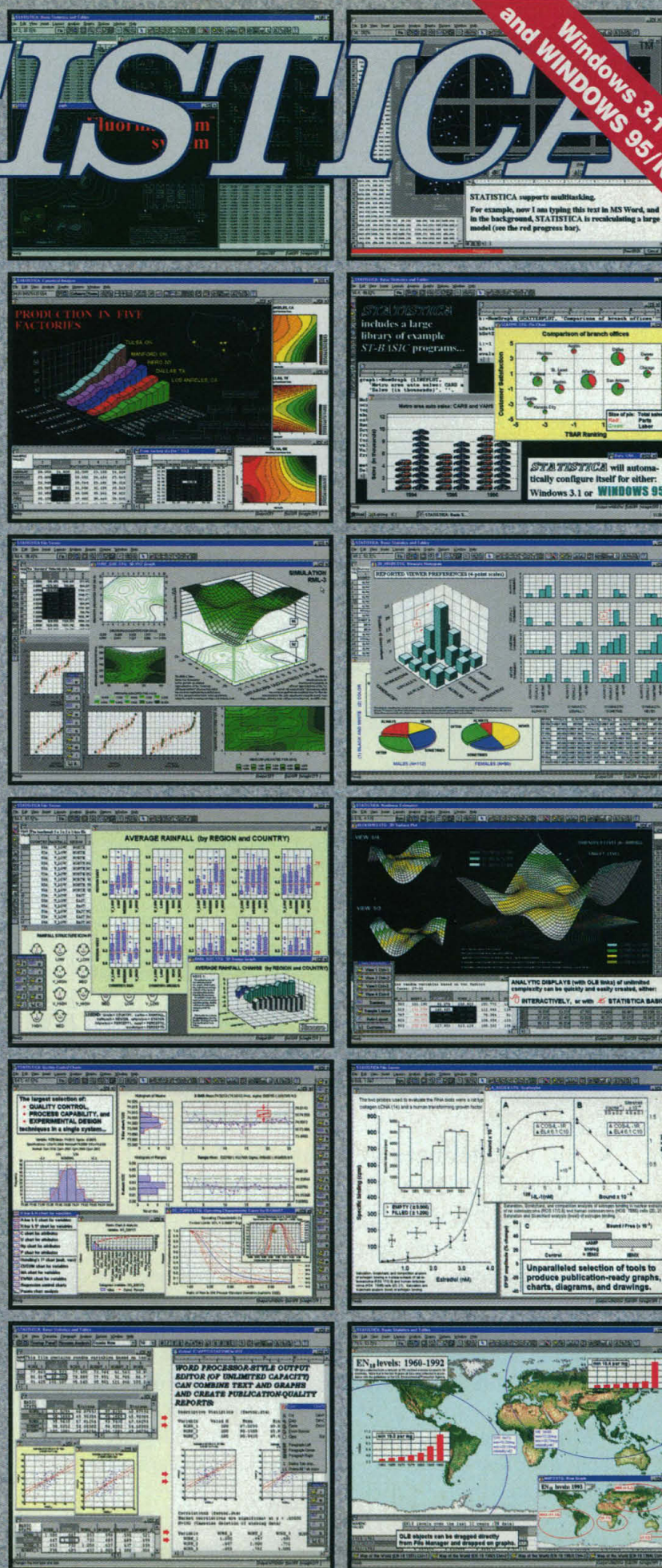
Circle No. 16 on Readers' Service Card

StatSoft®

2300 E. 14th St. • Tulsa, OK 74104 • (918) 749-1119
Fax: (918) 749-2217 • WEB: <http://www.statsoft.com>
e-mail: info@statsoft.com

StatSoft Ltd. (London, UK), ph: +44 1767/600166, fax: +44 1767/600144
StatSoft GmbH (Hamburg, Germany), ph: +49 40/4200347, fax: +49 40/4911310
StatSoft France (Paris, France), ph: +33 01-45-185-999, fax: +33 01-45-185-285
StatSoft Polska Sp. z o.o. (Krakow, Poland), ph: +48 12-391120, fax: +48 12-391121
StatSoft Italia (Padova, Italy), ph: +38 49-893-3227, fax: +38 49-893-2897
StatSoft Pacific Pty Ltd. (Australia), ph: +613 9521 4833, fax: +613 9521 4288

The complete line of StatSoft products and training/consulting services are available from authorized representatives worldwide, including: Austria, Belgium, Brazil, Chile, Czech Republic, Denmark, Finland, Greece, Hungary, India, Japan, Korea, Malaysia, Mexico, The Netherlands, New Zealand, Norway, Portugal, Russia, South Africa, Spain, Sweden, Switzerland, Turkey. Please contact your nearest Statsoft office for the authorized representative nearest you. StatSoft, the StatSoft logo, STATISTICA, and Scrollsheet are trademarks of StatSoft, Inc.





VERSATILITY AT EVERY TURN.

**Get 3 centrifuges in 1 with the SORVALL®
SUPER T 21 Benchtop Superspeed.**

Only the SORVALL® SUPER T 21 offers three centrifuges in a single system to meet all your personal centrifugation needs. It's a benchtop superspeed with the capacity, g-force and performance of a floor model; it's a refrigerated microcentrifuge; and it's a high-capacity lowspeed tabletop.

The SUPER T 21 accommodates an array of high-performance rotors that allow you to spin a wide variety of tubes, bottles and even microwell plates. Spin from low speeds up to 21,000 rpm and in capacities up to 3 Liters.

And not only is the SUPER T 21 simple to operate, it has a compact, durable design. It will fit easily on a benchtop right in your lab. These features, combined with its overall versatility and a capacity you'll never outgrow, make the SUPER T 21 the perfect personal centrifuge for both research and clinical applications.

For more information about the SUPER T 21, call 1-800-522-SPIN. In Europe, call (44) 1438 34 29 00 or Fax to (44) 1438 34 29 25. Or call your local SORVALL® representative.

SORVALL®
CENTRIFUGES

The best centrifuges going around.

Circle No. 42 on Readers' Service Card

When your HTS data rolls in, how will you stay afloat?

Who wouldn't want to take the plunge? The potential rewards of high throughput screening are enormous. Automated processes. The opportunity to screen millions, even billions of samples annually. More efficient and directed discovery programs.

But many laboratories fail to consider how they will manage the volumes of data generated by HTS programs. An inadequate system that fails to present all of the information generated by your lab in a format you can use can drag your HTS operation under like a riptide.

MDL SCREEN manages the data generated during every stage of the HTS process. Built on the solid foundation of ORACLE and designed in working HTS laboratories, the system can handle the variety and complexity of today's discovery research. And MDL SCREEN comes from MDL Information Systems, Inc., a company with nearly two decades of experience providing innovative solutions and services for managing discovery data.

Before you get all wet, talk to MDL about keeping your HTS program afloat with MDL SCREEN. Because in today's competitive research environment, you can't afford to go under.

MDL is a registered trademark and MDL SCREEN is a trademark of MDL Information Systems, Inc. ORACLE is a registered trademark of Oracle Corporation.



MDL

Information Systems, Inc.

14600 Catalina Street
San Leandro, CA 94577

510-895-1313

888-888-4635

Fax 510-483-4738

email: screen@mdli.com

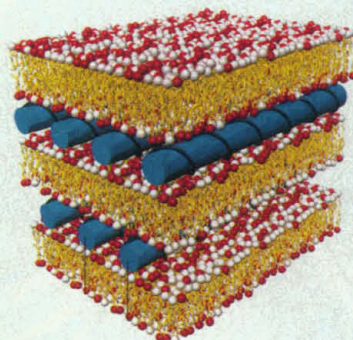
<http://www.mdli.com>

Circle No. 8 on Readers' Service Card



754

Flowing hot and cold



791 & 810

Ordered DNA-liposome
structures

NEWS & COMMENT

Too Radical for NIH? Try DARPA 744
Bracing for a Biological Nightmare 745

France: Archaeologists Take 746
to the Streets

U.K. Universities: Declining Enrollments, 747
Funds Threaten Small Departments

Monkey Virus DNA Found in Rare 748
Human Cancers

Mixed Reviews for Habitat Plan 749

Should Governments Support Science? 750

Peña Wins Reprieve on Realignment 750

RESEARCH NEWS

Obesity Sheds Its Secrets 751
Leptin's Other Hormonal Links 752

A New Driver for the Atlantic's Moods 754
and Europe's Weather?

A Case of Mistaken Identity? 754

Researchers Seek New Weapon 756
Against the Flu

First Nematode-Resistance Gene 757
Found

Dusty Roads of the Cosmos Lure 758
New Explorers

Mathematics: Homage to an Itinerant 759
Master

BIOTECHNOLOGY

BETTING ON THE GENOME

The Genomics Gamble 767
How Many Genes Are There? 769

Hype Surrounds Genomics Inc. 770

The Industry's Top Showman ... 773

... And a Recent Recruit 773

Genomics's Wheelers and Dealers 774

Developing Prescriptions With 776
a Personal Touch

Is Data-Hoarding Slowing the Assault 777
on Pathogens?

Genomics's Odd Couple 778

Companies Rush to Patent DNA 780

Gene Tests Get Tested 782

DEPARTMENTS

THIS WEEK IN SCIENCE 729

EDITORIAL 735

NASA's New Science Vision
E. J. Chaisson

LETTERS 737

Disposing of Plutonium: R. C. Ewing and W. Lutze;
M. Steinberg • Science in Chile: I. N. Saavedra • El
Niño and Infectious Disease: X. B. Yang • Atmo-
sphere Nitrogen Deposition: B. A. Hungate, T. E. Jordan,
R. B. Jackson, B. G. Drake; G. M. Henebry; D. A.
Wedin and D. Tilman • Grizzly Habitat: F. Shilling

SCIENCESCOPE 743

RANDOM SAMPLES 761

How to Avoid Running Out of Steam • Stand By
for a Comet's Media Aftershocks • Where Do
Ph.D.s Go? • Micromasure

BOOK REVIEWS 787

Science, Jews, and Secular Culture, reviewed by R.
Westbrook • *History of Original Ideas and Basic Discoveries in Particle Physics*, J. D. Jackson

PRODUCTS & MATERIALS 855

AAAS Board of Directors

Rita R. Colwell
Retiring President, Chairman
Jane Lubchenco
President
Mildred S. Dresselhaus
President-elect

Sheila Jasanoff
William A. Lester Jr.
Simon A. Levin
Marcia C. Linn
Michael J. Novacek
Anna C. Roosevelt
Jean E. Taylor
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, 1200 New York Avenue, NW, Washington, DC 20005. Periodicals Mail postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Copyright © 1997 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): \$105 (\$58 allocated to subscription). Domestic institutional subscription (51 issues): \$260. Foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$90. 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.

COVER

Propagation of an intercellular calcium wave through glial cells on the surface of the retina. Five frames (clockwise, starting at upper left, 0.93-second intervals) show the leading edge of the calcium wave as it travels outward from the point of stimulation. The wave was imaged by

labeling rat retinal astrocytes and Müller cells with a calcium indicator dye and is shown as a pseudocolor image. The largest ring is 190 micrometers in diameter. See page 844 and films at <http://enlil.med.umn.edu/www/phsl/work/caw.htm>. [Image: E. A. Newman and K. R. Zahs]



PERSPECTIVES

Subterranean Life 789
W. C. Ghiorse

Organelle Genomes: Going, Going, Gone! 790
J. D. Palmer

DNA Ordering on a Lipid Membrane 791
M. S. Spector and J. M. Schnur

Webwatch 792

POLICY FORUM

The Scientific Wealth of Nations 793
R. M. May

ARTICLE

Anthropoid Origins 797
R. F. Kay, C. Ross, B. A. Williams

REPORTS

Interdecadal Climate Fluctuations That Depend on Exchanges Between the Tropics and Extratropics 805
D. Gu and S. G. H. Philander

Structure of DNA-Cationic Liposome Complexes: DNA Intercalation in Multilamellar Membranes in Distinct Interhelical Packing Regimes 810
J. O. Rädler, I. Koltover, T. Salditt, C. R. Safinya

The Water Dipole Moment in Water Clusters 814
J. K. Gregory, D. C. Clary, K. Liu, M. G. Brown, R. J. Saykally

On the Quantum Nature of the Shared Proton in Hydrogen Bonds 817
M. E. Tuckerman, D. Marx, M. L. Klein, M. Parrinello

Direct Measurement of a Tethered Ligand-Receptor Interaction Potential 820
J. Y. Wong, T. L. Kuhl, J. N. Israelachvili, N. Mullah, S. Zalipsky

Fluorous Synthesis: A Fluorous-Phase Strategy for Improving Separation Efficiency in Organic Synthesis 823
A. Studer, S. Hadida, R. Ferritto, S.-Y. Kim, P. Jeger, P. Wipf, D. P. Curran

Recharge in Volcanic Systems: Evidence from Isotope Profiles of Phenocrysts 826
J. P. Davidson and F. J. Tepley III

Selective Use of TBP and TFIIB Revealed by a TATA-TBP-TFIIB Array with Altered Specificity 829
W. P. Tansey and W. Herr

Positional Cloning of a Gene for Nematode Resistance in Sugar Beet 832
D. Cai, M. Kleine, S. Kifle, H.-J. Harloff, N. N. Sandal, K. A. Marcker, R. M. Klein-Lankhorst, E. M. J. Salentijn, W. Lange, W. J. Stiekema, U. Wyss, F. M. W. Grundler, C. Jung

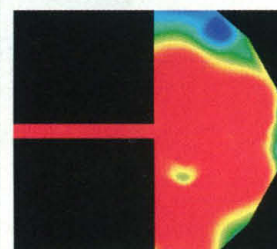
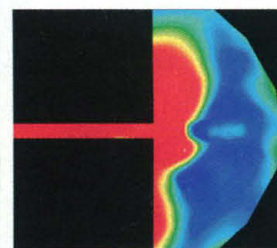
Two Modulatory Effects of Attention That Mediate Object Categorization in Human Cortex 835
G. Rees, R. Frackowiak, C. Frith

Dopaminergic Neurons Protected from Degeneration by GDNF Gene Therapy 838
D. L. Choi-Lundberg, Q. Lin, Y.-N. Chang, Y. L. Chiang, C. M. Hay, H. Mohajeri, B. L. Davidson, M. C. Bohn

Paradoxical Improvement of Impulse Conduction in Cardiac Tissue by Partial Cellular Uncoupling 841
S. Rohr, J. P. Kucera, V. G. Fast, A. G. Kléber

Calcium Waves in Retinal Glial Cells 844
E. A. Newman and K. R. Zahs

Joining the Two Domains of a Group I Ribozyme to Form the Catalytic Core 847
M. A. Tanner and T. R. Cech



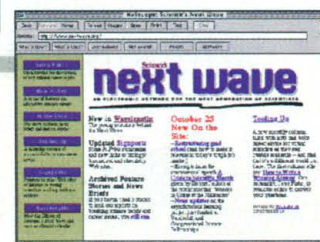
841
The beat generation

■ Indicates accompanying feature

Change of address: allow 4 weeks, giving old and new addresses and 8-digit account number.
Postmaster: Send change of address to *Science*, P.O. Box 1811, Danbury, CT 06813-1811.
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 \$4.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification code for *Science* is 0036-8075/93 \$4.00. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

On the Web

New career niche:
Technical Services
Catch the Next Wave at
<http://www.nextwave.org>



How to Find the Perfect Transfection Tool.

If you're looking for a transfection tool that provides maximum transfection efficiency, look no further. The PerFect Lipid™ Transfection Kit allows you to test a panel of eight unique lipids so you can quickly and easily find the one that yields the highest efficiency in your cell line.

Maximize Efficiency

The efficiency of lipid-mediated transfection varies greatly depending on the cell line and lipid used (Figure 1).

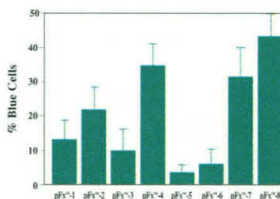


Figure 1: Percent blue cells produced by transfection of CHO cells with a lacZ control vector using PerFect Lipids™ (pFx 1-8).

That's why we developed the PerFect Lipid™ Transfection Kit. Now finding the right lipid for your cell line is easy. Simply transfect the supplied β -galactosidase reporter plasmid with each of the eight PerFect Lipids™ (pFx™1-8) and assay for the percent of blue cells (Figure 2).

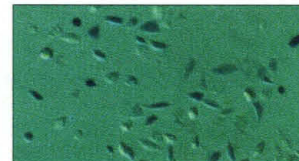


Figure 2: Transfected CHO cells expressing β -galactosidase, stained with X-gal.

Minimize Cost

Once you've found the perfect lipid you can continue to achieve optimum transfection efficiencies. Each PerFect Lipid™ is available in individual pack sizes that are convenient and economical to use.

Tested for Results

To make it even easier for you to choose the right lipid, we've tested the PerFect Lipids™ in a variety of common cell lines. To see for yourself, check out our web site (<http://www.invitrogen.com>) or call our Technical Services Department.

For perfect transfections with every cell line, there's no better choice than the PerFect Lipid™ Transfection Kit and PerFect Lipids™. For more information or to place your order, call today.



Telephone (619) 597-6200

Fax (619) 597-6201

<http://www.invitrogen.com>

1-800-955-6288

Circle No. 29 on Readers' Service Card

EUROPEAN HEADQUARTERS:

Invitrogen BV
De Schelp 12, 9351 NV Leek
The Netherlands
Tel: +31 (0) 594 515 175
Fax: +31 (0) 594 515 312
Email: tech_service@invitrogen.nest.nl

Distributors:

Australia 03 9562 6888	Korea 822 569 6902
Hong Kong 886 2 381 0844	Singapore 64 482 3888
Israel 02 524 447	or 29 29 783
Italy 02 33 91 00 72	Spain 03 450 2601
Japan 03 5684 1616	Taiwan 886 2 381 0844

From all other countries, please contact our European headquarters at +31 (0) 594 515 175

PerFect Lipids™ are manufactured by Genta, Inc. and licensed to Invitrogen Corporation.

TOLL FREE TELEPHONE NUMBERS:

Belgium 0800 111 73	The Netherlands 06 022 8848
Denmark 800 188 67	Norway 800 113 70
Finland 990 31 800 5345	Sweden 020 795 369
France 19 31 800 5345	Switzerland 155 1966
Germany 0130 8100 43	UK 0800 96 61 93

Distant relatives

Fossil evidence indicates that primates arose by the Eocene, about 55 million years ago. Although some new finds have provided key information on their early history, some other aspects are uncertain or controversial, such as the relation (and in some cases identification) of early anthropoids (distant ancestors of humans) to other primates. In an article, Kay *et al.* (p. 797) overview recent fossil finds and present a phylogenetic synthesis.

Warming trend

The El Niño–Southern Oscillation phenomenon in the tropical Pacific has a periodicity of 3 to 4 years, but longer term oscillations may be superimposed on these fluctuations. Gu and Philander (p. 805) present a mechanism for these longer oscillations in a model that links the extra-tropics and tropics. Influx of warm water from higher latitudes into the tropics triggers a feedback cycle with an interdecadal periodicity. Such a mechanism may be responsible for the recent but yet unexplained warm conditions that have persisted over the tropical Pacific.

Westward flow

A circumglobal equatorial seaway, the Tethys Seaway, existed during the Cretaceous from about 145 to 65 million years ago, and perhaps even longer ago. It has been suggested that a westward flowing current through this seaway was important in dispersal of fauna and in controlling at least equatorial climates, but numerical models of ocean circulation

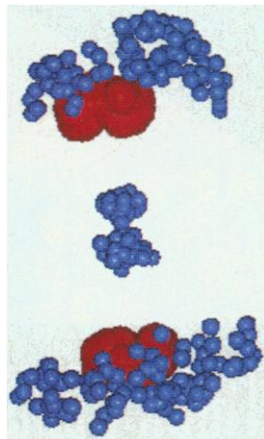
Joining the resistance

Hybridization between the sugar beet and related species has brought resistance to pathogenic soil nematodes into the naturally unprotected sugar beet. Cai *et al.* (p. 832; see the news story by Moffat, p. 757) mapped chromosomal breakage points to identify and clone the gene conferring resistance. The *Hs1^{pro-1}* gene encodes a protein with similarities to those that confer gene-for-gene response to bacterial pathogens.

have had difficulty in reproducing this flow pattern. Bush (p. 807) now reports results from a coupled atmosphere-ocean model in which a westward circumglobal current appears as a robust feature.

Clusters within water

Two reports focus on the chemical and physical properties of water and their dependence on cluster size and charge. Gregory *et al.* (p. 814) combined theory and experi-



ment to study the dipole moments of water clusters consisting of two to six molecules. The polarizability of the water hexamer is close to that of liquid water and ice, indicating that the water hexamer may represent the dominant interactions present in these condensed phases. Tuckerman *et al.* (p. 817) present ab initio

calculations for the charged water complexes $H_5O_2^+$ and $H_3O_2^-$, which are prototypes of strong and intermediate-strength hydrogen-bonded systems. The quantum character of the shared proton depended on the oxygen-oxygen distance and thus, bond strength; the strong $H_5O_2^+$ complex behaved classically, whereas the $H_3O_2^-$ complex showed quantum effects even at room temperature. These results may also have implications for proton transfer dynamics.

Tagged for ready recovery

A synthetic route is successful only if the desired product can be recovered cleanly. Studer *et al.* (p. 823) have taken advantage of the unusual solubility of fluorocarbon groups to recover products without chromatographic separations. For example, by tagging one of the reactants with a fluorocarbon group, the product, which carries the tag, can be recovered in a fluorocarbon liquid phase. Leftover reactants and by-products will separate into organic or aqueous phases.

Recharging volcanoes

Isotopic studies have provided important information on processes in magma chambers, such

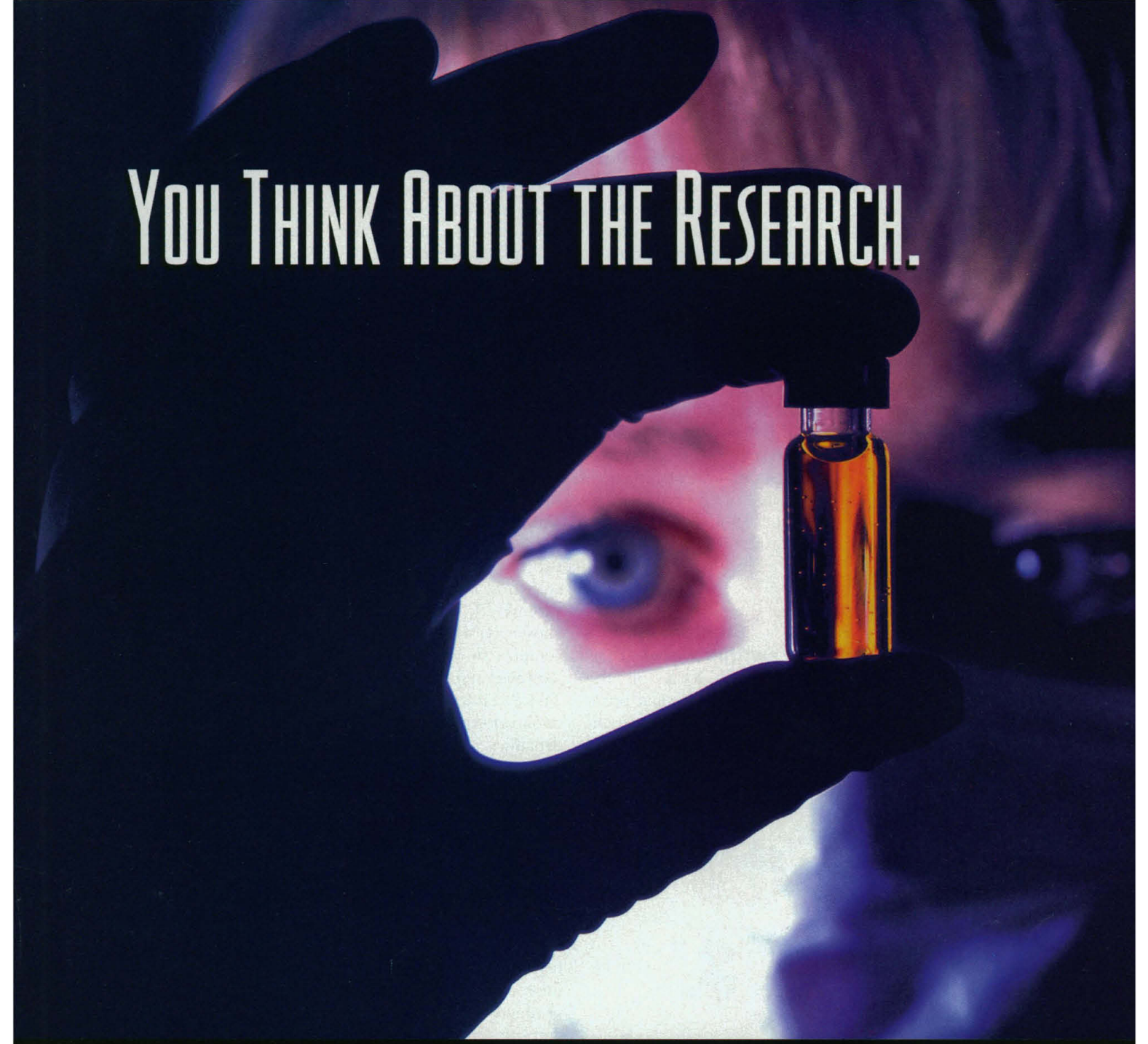
as the extent that magmas melt and then mix with adjacent rocks or the amount of mixing with other magmas. Davidson and Tepley (p. 826) show that a detailed record of such processes can be extracted by looking at strontium isotopic variations in zoned plagioclase crystals forming from the magmas. In three case studies, sudden jumps in the isotopic composition corresponded to changes in mineral chemistry and likely mark discrete recharge events.

Visual searching

How do we find the ten of diamonds in a deck of cards thrown faceup on a table? The biased competition model of visual attention suggests that we bias our search for cards with red pips (a top-down factor) and we detect which of these cards most strongly matches the requirements of ten pips and diamond shapes. Rees *et al.* (p. 835) provide evidence from functional imaging studies suggesting that the dorsolateral prefrontal cortex in humans contributes the bias signal to the inferior temporal cortex that mediates object recognition.

Neuron protection

The loss of dopaminergic neurons in a critical spot in the brain, the substantia nigra, is a hallmark of Parkinson's disease. Choi-Lundberg *et al.* (p. 838) have used an adenoviral vector to deliver a neuronal growth factor to just that region of the brain. Tests of this procedure in a rat model of Parkinson's disease show that loss of the neurons after induced degeneration is slowed relative to the rate in untreated rats.



YOU THINK ABOUT THE RESEARCH.

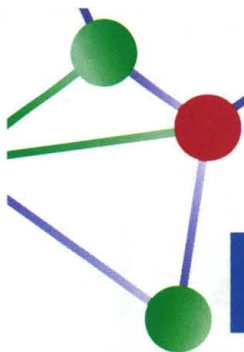
WE'LL THINK ABOUT THE GLOVES.

*POLYMER-REINFORCED, POWDERFREE SYNETRON™.
THE MOST TECHNOLOGICALLY ADVANCED GLOVE FOR HIGH RISK HANDS.*

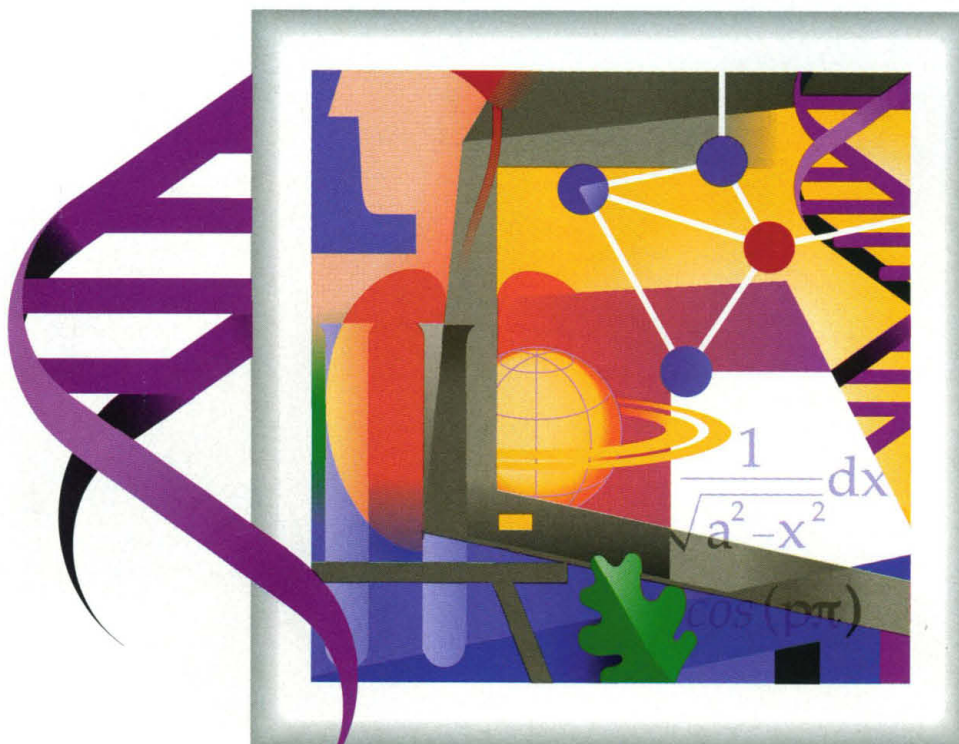
MICRO+FLEX®
THE MOST TRUSTED NAME IN GLOVES®

*FOR FREE SAMPLES, PURCHASES OR A DISTRIBUTOR NEAR YOU, CALL 1-800-876-6866. ASK FOR CODE SCM 0297.
YOU MAY ALSO FAX YOUR REQUEST TO 1-800-876-6632.*

Circle No. 15 on Readers' Service Card



GET BETTER NET RESULTS



KR SCIENCEBASESM FOR THE WORLD WIDE WEB

When you need accurate, up-to-date information for chemical, pharmaceutical, or biotechnology research, the fastest and easiest way to get the results you're looking for is KR ScienceBase.

You don't have to search multiple sources on the Internet. You don't need specialized expertise in information searching. You don't even need to leave your desk.

With its simple point-and-click interface, KR ScienceBase brings you information that helps you make better

decisions, fuels your creativity, accelerates your research – and reduces your time to market.

Built-in search intelligence works to bring you the results you're looking for. And you can count on the information you find. KR ScienceBase is based on DIALOG®, the world's premier online service with access to thousands of publications and scientific sources.

So get the results you need... KR ScienceBase.

SIGN UP TODAY!

<http://krscience.dialog.com>

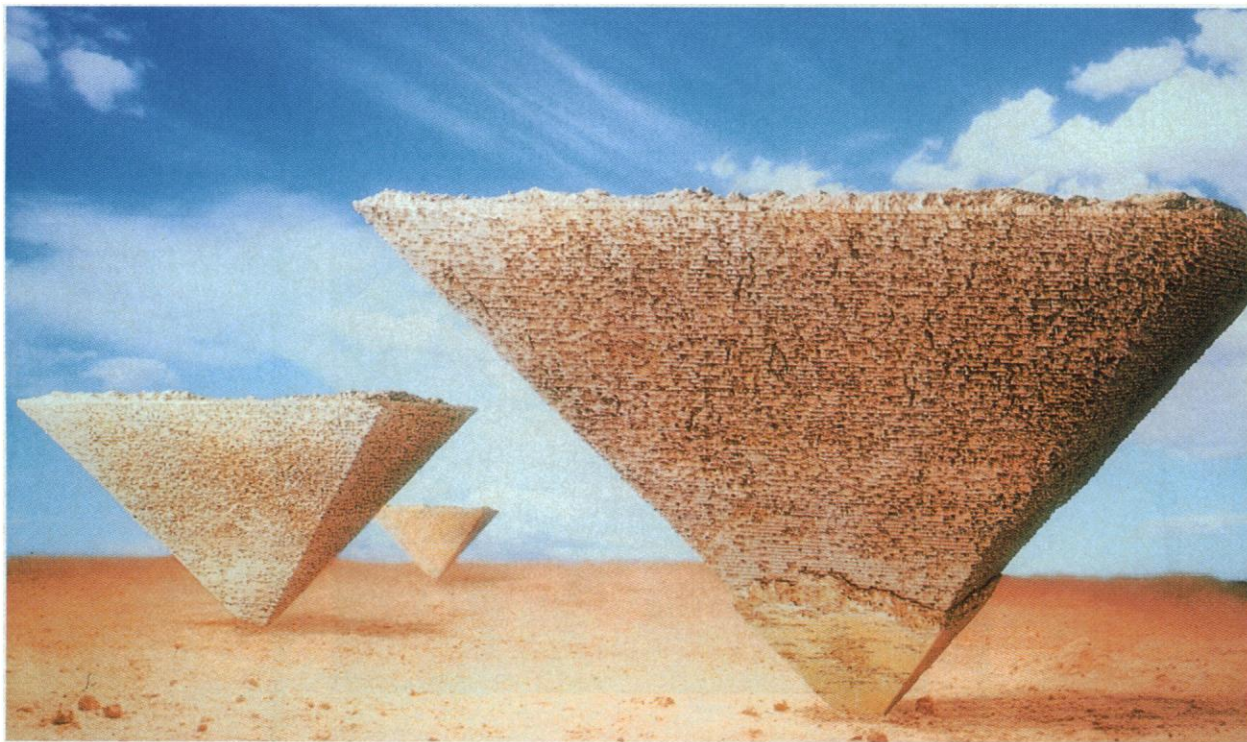
Or call 800-334-2564, 415-254-8800, or fax 415-254-8123.

In Europe call +44 171 930 5503.

KR SCIENCEBASESM
KNIGHT-RIDDER INFORMATION

© 1996 Knight-Ridder Information, Inc., 2440 El Camino Real, Mountain View, CA 94040
KR ScienceBase is a service mark, DIALOG is a registered service mark of Knight-Ridder Information, Inc. Registered U.S. Patent and Trademark Office. krsb396
Circle No. 2 on Readers' Service Card

Leave No Stone Unturned.



You know the answers you need are out there. Lost under masses of data. To uncover them, leverage the world's most complete collection of scientific information right from your desktop with Knight-Ridder Information.

Search everything from technical and patent literature to industry information....online with DIALOG®, on CD-ROM, on the Web, or use our document delivery service. Whether you're searching individually or organization-wide, you'll have the freedom to transform information into insight, the impulse of science. You don't need to turn the world upside-down.

Find out more with Knight-Ridder Information –
more easily, more quickly, more productively.

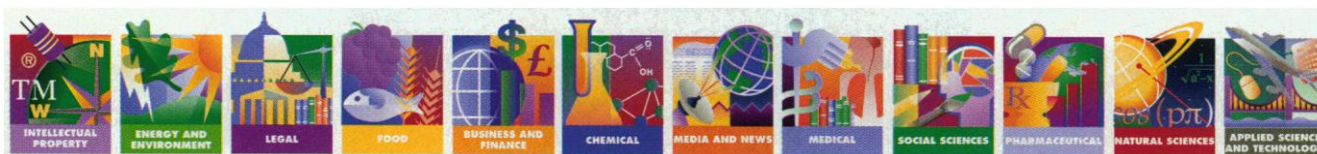
Call toll-free in the US: 800-334-2564.

In Canada and California: 415-254-8800. Europe e-mail: enquiries@dm.krinfo.ch

Or visit us at <http://www.krinfo.com>.



**KNIGHT-RIDDER
INFORMATION**



INFORMATION SOLUTIONS ONLINE, ON CD-ROM, ON THE WEB, ON PAPER

©1996 Knight-Ridder Information, Inc. 2440 W. El Camino Real, Mountain View CA 94040. All rights reserved. DIALOG is a service mark of Knight-Ridder Information, Inc. Registered U.S. Patent and Trademark Office. scitad

Circle No. 1 on Readers' Service Card

MEMBERSHIP/CIRCULATION

Deputy Director: Marlene Zendell

Member Services: Mary Curry, *Supervisor*; Pat Butler, Laurie Baker, Yvette Carter, Jonathan Keeler, *Representatives*

Marketing: Dee Valencia, *Manager*; Jane Pennington, *Europe Manager*; Hilary Baar, *Assistant Manager*; Lauri Sirois, *Coordinator*

Research: Renuka Chander, *Manager*

Business and Finance: Robert Smariga, *Manager*, Kimberly Parker, *Coordinator*

Computer Specialist: Charles Munson

ADVERTISING AND FINANCE

Advertising Sales Manager: Susan A. Meredith

Recruitment Advertising Manager: Janis Crowley

Business Manager: Deborah Rivera-Wienhold

Finance: Randy Yi, *Senior Analyst*; Connie Dang, *Financial Analyst*

Marketing: John Meyers, *Manager*; Allison Pritchard, *Associate*

Electronic Media: David Gillikin, *Manager*; Mark Croatti, Crystal Young, *Production Associates*

Product Advertising: Carol Maddox, *Traffic Manager*; Natalie Britt, *Sales Associate*

Product Advertising Sales: East Coast/E. Canada: Richard Teeling, 201-904-9774, FAX 201-904-9701 •

Midwest/Southeast: Elizabeth Mosko, 773-665-1150, FAX 773-665-2129 • West Coast/W. Canada: Neil Boylan, 415-673-9265, FAX 415-673-9267 • UK, Scandinavia, France, Italy, Belgium, Netherlands: Andrew Davies, (44) 1-457-871-073, FAX (44) 1-457-877-344 •

Germany/Switzerland/Austria: Tracey Peers, (44) 1-260-297-530, FAX (44) 1-260-271-022 • Japan: Mashy Yoshikawa, (81) 3-3235-5961, FAX (81) 3-3235-5852

Recruitment Advertising: Terri Seiter Azie, *Sales and Production Operations Manager*; Celeste Miller, *Sales Supervisor*; Eric Banks, Troy Benitez, Bren Peters-Minnis, Bethany Ritchey, *Sales*; Debbie Cummings, *European Sales Manager*; Wendy Green, *Production Associate*; Nicole Robinson, *Advertising Assistant*

Recruitment Advertising Sales: US: Celeste Miller, 202-326-6543, FAX 202-289-6742 • Europe: Debbie Cummings, (44) 1223-302067, FAX (44) 1223-576208 • Australia/New Zealand: Keith Sandell, (61) 02-922-2977, FAX (61) 02-922-1100 • Japan: Mashy Yoshikawa, (81) 3-3235-5961, FAX (81) 3-3235-5852

Assistant to Associate Publisher: Nancy Hicks

Permissions: Lincoln Richman

Send materials to *Science* Advertising, 1200 New York Avenue, NW, Washington, DC 20005.

SCIENCE EDITORIAL BOARD

Charles J. Arntzen
David Baltimore
J. Michael Bishop
William F. Brinkman
E. Margaret Burbidge
Pierre-Gilles de Gennes
Joseph L. Goldstein
Mary L. Good
Harry B. Gray

John J. Hopfield
F. Clark Howell
Paul A. Marks
Yasutomi Nishizuka
Helen M. Ranney
Bengt Samuelsson
Robert M. Solow
Edward C. Stone
James D. Watson
Richard N. Zare

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

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

INFORMATION RESOURCES

SUBSCRIPTION SERVICES

For change of address, missing issues, new orders and renewals, and payment questions, please contact AAAS at Danbury, CT: 800-731-4939 or Washington, DC: 202-326-6417, FAX 202-842-1065. Mailing addresses: AAAS, P.O. Box 1811, Danbury, CT 06813 or AAAS Member Services, 1200 New York Avenue, NW, Washington, DC 20005 • Other AAAS Programs: 202-326-6400

REPRINTS & PERMISSION

Reprints: Ordering/Billing, 800-407-9191; Corrections, 202-326-6501 • Permissions: 202-326-7074, FAX 202-682-0816

INTERNET ADDRESSES

science_editors@aaas.org (for general editorial queries); science_news@aaas.org (for news queries); science_letters@aaas.org (for letters to the editor); science_reviews@aaas.org (for returning manuscript reviews); science@science-int.co.uk (for the Europe Office); membership@aaas.org (for member services); science_classifieds@aaas.org (for submitting classified advertisements); science_advertising@aaas.org (for product advertising)

INFORMATION FOR CONTRIBUTORS

See pages 98–99 of the 3 January 1997 issue or

access <http://www.sciencemag.org/science/home/con-info.shtml>.

EDITORIAL & NEWS CONTACTS

North America

Address: 1200 New York Avenue, NW, Washington, DC 20005

Editorial: 202-326-6501, FAX 202-289-7562

News: 202-326-6500, FAX 202-371-9227 • **Bureaus:** Berkeley, CA: 510-841-1154, FAX 510-841-6339, San Diego, CA: 619-942-3252, FAX 619-942-4979, Chicago, IL: 312-360-1227, FAX 312-360-0537, Boston, MA: 617-566-7137, FAX 617-734-8088

Europe

Headquarters: 14 George IV Street, Cambridge, UK CB2 1HH; (44) 1223-302067, FAX (44) 1223-302068

Paris Correspondent: (33) 1-49-29-09-01, FAX (33) 1-49-29-09-00

Asia

Japan Office: Carl Kay, Esaka-cho 5-chome 11-10, Suita-shi, Osaka 564 Japan; (81) 6-368-1925, FAX (81) 6-368-6905; science@magical.egg.or.jp

• **News Bureau:** (81) 3-3335-9925, FAX (81) 3-3335-4898 • **China Office:** Hao Xin, (86)10-6255-9478; science@public3.bta.net.cn

BOARD OF REVIEWING EDITORS

Frederick W. Alt
Children's Hospital, Boston
Don L. Anderson
California Institute of Technology
Michael Ashburner
Univ. of Cambridge
Stephen J. Benkovic
Pennsylvania State Univ.
Alan Bernstein
Mount Sinai Hospital, Toronto
Seth Blair
Univ. of Wisconsin, Madison
David E. Bloom
Harvard Institute for International Development
Piet Borst
The Netherlands Cancer Institute
Henry R. Bourne
Univ. of California, San Francisco
Michael S. Brown
Univ. of Texas Southwestern Medical Center
James J. Bull
Univ. of Texas at Austin
Kathryn Calame
Columbia Univ. College of Physicians & Surgeons
Dennis W. Choi
Washington Univ. School of Medicine, St. Louis
David Clapham
Mayo Foundation
Adrienne E. Clarke
Univ. of Melbourne, Parkville
John M. Coffin
Tufts Univ. School of Medicine
F. Fleming Crim
Univ. of Wisconsin, Madison
Paul J. Crutzen
Max-Planck-Institut für Chemie
James E. Dahlberg
Univ. of Wisconsin Medical School, Madison
Robert Desimone
National Institute of Mental Health, NIH
Paul T. Englund
Johns Hopkins Univ. School of Medicine

G. Ertl
Max-Planck-Gesellschaft
Richard G. Fairbanks
Lamont-Doherty Earth Observatory
Robert E. Fay
U.S. Bureau of the Census
Douglas T. Fearon
Univ. of Cambridge
Harry A. Fozzard
The Univ. of Chicago
Roger I. M. Glass
Centers for Disease Control
Stephen P. Goff
Columbia Univ. College of Physicians & Surgeons
Peter N. Goodfellow
SmithKline Beecham, UK
Peter Gruss
Max Planck Institute of Biophysical Chemistry
Philip C. Hanawalt
Stanford Univ.
Paul Harvey
Univ. of Oxford
M. P. Hassell
Imperial College at Silwood Park
Nobutaka Hirokawa
Univ. of Tokyo
Tomas Hökfelt
Karolinska Institutet
Tasuku Honjo
Kyoto Univ.
Susan D. Iversen
Univ. of Oxford
Eric F. Johnson
The Scripps Research Institute
Hans Kende
Michigan State Univ.
Elliott Kieff
Harvard Univ.
Jeffrey T. Kiehl
National Center for Atmospheric Research, Boulder
Judith Kimble
Univ. of Wisconsin, Madison
Stephen M. Kosslyn
Harvard Univ.
Michael LaBarbera
The Univ. of Chicago
Nicole Le Douarin
Institut d'Embryologie Cellulaire et Moléculaire du CNRS

Harvey F. Lodish
Whitehead Institute for Biomedical Research
Richard Losick
Harvard Univ.
Reinhard Lührmann
Institut für Molekularbiologie und Tumorforschung der Philipps-Universität
Ruth Lynden-Bell
Queen's Univ., Belfast
Seth Marder
California Institute of Technology
Diane Mathis
Institut de Chimie Biologique, Strasbourg
Susan K. McConnell
Stanford Univ.
Anthony R. Means
Duke Univ. Medical Center
Stanley Meisel
Univ. of California, Davis
Douglas A. Melton
Harvard Univ.
Shigetada Nakanishi
Kyoto Univ.
Kim Nasmyth
Research Institute of Molecular Pathology, Vienna
Roger A. Nicoll
Univ. of California, San Francisco
Staffan Normark
Swedish Institute for Infectious Disease Control
Kiyotaka Okada
Kyoto Univ.
Bert W. O'Malley
Baylor College of Medicine
Stuart L. Pimm
The Univ. of Tennessee, Knoxville
Yeshayahu Pocker
Univ. of Washington, Seattle
Ralph S. Quatrano
Univ. of North Carolina, Chapel Hill
Martin Raff
Univ. College London
Douglas C. Rees
California Institute of Technology
T. M. Rice
ETH-Hönggerberg, Zürich
David C. Rubie
Universität Bayreuth

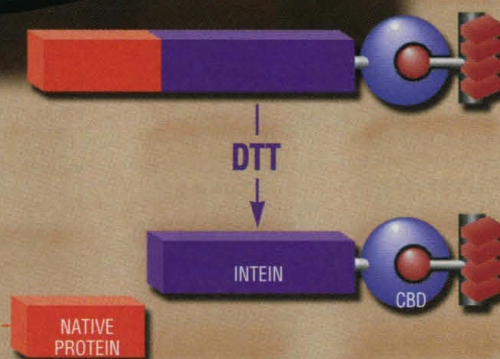
Erkki Ruoslahti
The Burnham Institute, CA
Gottfried Schatz
Biozentrum, Basel
Jozef Schell
Max-Planck-Institut für Zuchtungsforschung
Ronald H. Schwartz
National Institute of Allergy and Infectious Diseases, NIH
Terrence J. Sejnowski
Salk Institute
Christopher R. Somerville
Carnegie Institute of Washington
Thomas A. Steitz
Yale Univ.
Michael P. Stryker
Univ. of California, San Francisco
Cliff Tabin
Harvard Medical School
John Jen Tai
Academia Sinica, Taiwan
Tomoyuki Takahashi
Univ. of Tokyo
Masatoshi Takeichi
Kyoto Univ.
Keiji Tanaka
RIKEN Institute
David Tilman
Univ. of Minnesota, St. Paul
Robert T. N. Tjian
Univ. of California, Berkeley
Yoshinori Tokura
Univ. of Tokyo
Derek van der Kooy
Univ. of Toronto
Geerat J. Vermeij
Univ. of California, Davis
Bert Vogelstein
Johns Hopkins Oncology Center
Arthur Weiss
Univ. of California, San Francisco
Robin A. Weiss
The Institute of Cancer Research, London
Zena Werb
Univ. of California, San Francisco
George M. Whitesides
Harvard Univ.
Owen N. Witte
Univ. of California, Los Angeles

NEW ENGLAND BIOLABS INTRODUCES...

ONE STEP NATIVE PROTEIN PURIFICATION



Purification of Maltose-Binding Protein (MBP) with >98% Purity in one step.
Std: NEB Broad Range Protein Marker
Lane 1: uninduced cell extract. Lane 2: induced cell extract showing expressed fusion protein (97 kDa). Lane 3: Flow through. Lane 4 and 5: MBP fractions eluted after inducing cleavage overnight at 4°C.



So FAST IT'S SURREAL

Introducing **IMPACT™**, a new kit for obtaining pure native protein after a single affinity step. Developed from basic research at New England Biolabs on protein splicing, **IMPACT™** uses a new class of proteins called "inteins" modified to undergo directed cleavage at 4°C when induced by thiol-reagents such as DTT. Simply clone your target protein into the provided expression vector to create a *target protein-intein-chitin binding domain (CBD)* fusion. Bind the fusion protein to a chitin bead column, wash, induce on-column intein cleavage by adding DTT and then elute your native target protein at > 98% purity.

Advantages of the IMPACT™ system

- One step affinity purification
- Procedure carried out at 4°C
- Yields protein with native sequence
- No polyhistidine tags
- No proteolytic cleavage of fusion protein
- Requires only chitin beads
- Can label target protein C-terminus

Circle No. 44 on Readers' Service Card

For more information, call 1-800-NEB-LABS or visit the NEB web site: <http://www.neb.com>

THE NEXT STEP

- 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 (07) 5594-0299; Belgium (0800) 1 9815; Brazil (011) 66-3565; Denmark (31) 56 20 00; Finland (9) 584-121; France (1) 34 60 24 24; Greece (01) 5226547; Hong Kong 2649-9988; India (542) 311473; Israel (03) 5351205; Italy (02) 381951; Japan (03) 5820-9408; 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) 30 60 10; Switzerland (061) 481 47 13; Taiwan (02) 8802913

 **NEW ENGLAND**
BioLabs Inc.

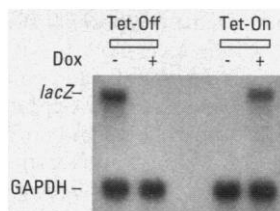
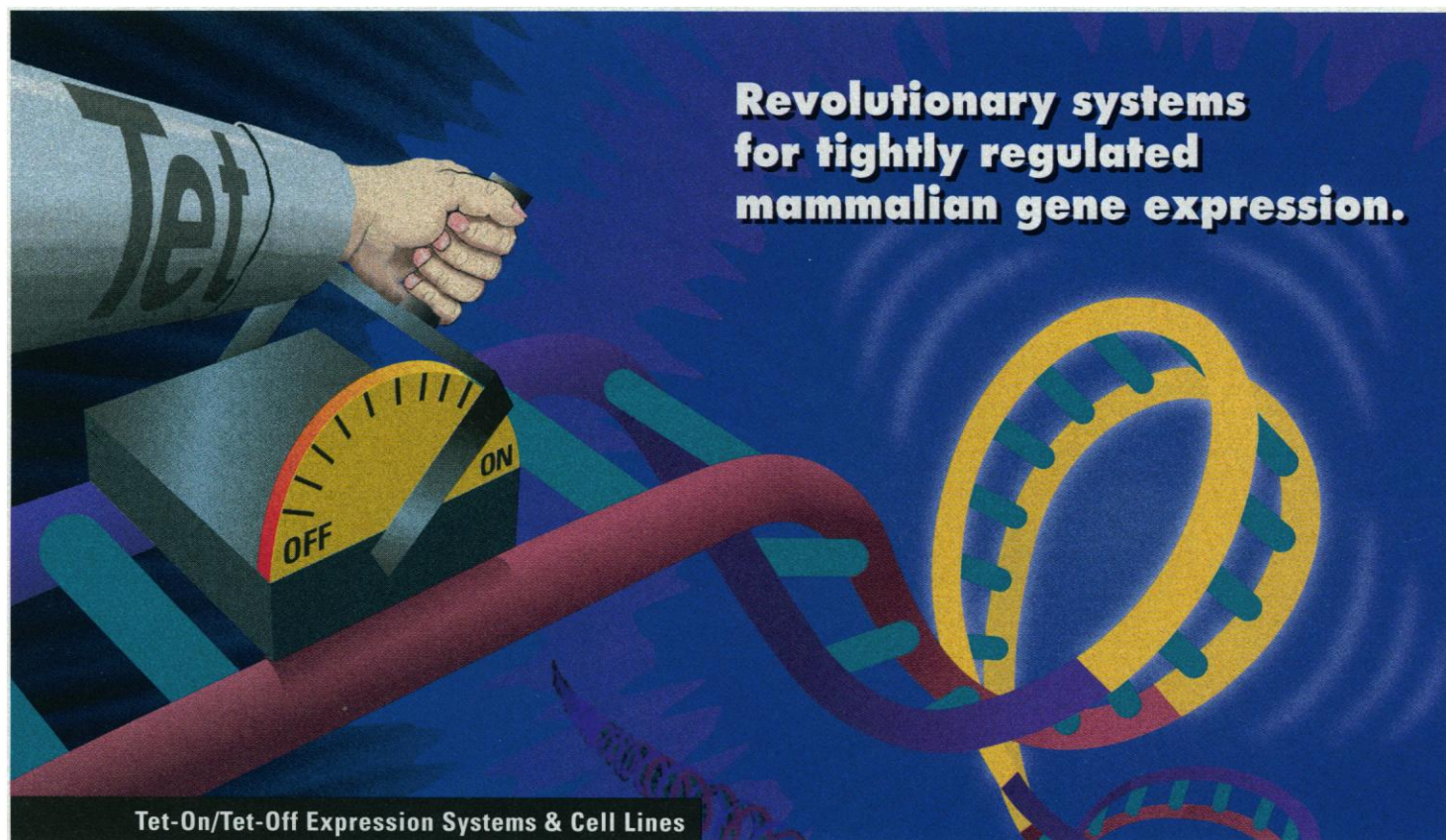


Figure 1. Inducible on/off control of gene expression. HeLa Tet-Off and Tet-On cell lines stably expressing a tet-regulated pTRE-derived plasmid with the *E. coli lacZ* gene were cultured in the absence or presence of 1 µg/ml Dox. For Northern analysis, 10 µg of total RNA per lane was hybridized simultaneously with *lacZ* and GAPDH probes.

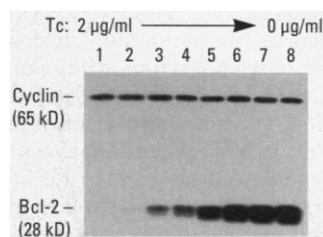


Figure 2. Inducible, high-level expression of the Bcl-2 apoptosis gene. HeLa S3 Tet-Off Cells stably transformed with tet-regulated pTRE-Bcl-2 were grown in 2.0, 0.006, 0.004, 0.002, 0.001, 0.0005, 0.00025, and 0 µg/ml of Tc (Lanes 1–8, respectively). A Western blot containing 100 µg of total protein from each condition was simultaneously probed with human Bcl-2-specific and human cyclin-B1-specific mouse monoclonal antibodies. Tc gave 100-fold induction of Bcl-2.

CLONTECH's new **Tet-On** and **Tet-Off Gene Expression Systems** (#K1621-1 and K1620-1, respectively) and **Cell Lines** (please inquire) provide high-level gene expression in mammalian cells. Obtain induction levels of more than **1,000-fold** in response to tetracycline (Tc) or doxycycline (Dox), a tetracycline derivative. Induction is precisely regulated by the concentration of Tc or Dox in the media so you tightly control expression levels. Also, induction is specific to the cloned gene, eliminating the pleiotropic effects that occur in many other inducible systems.

The **tight, precise, and specific** response of the Tet Systems make "*in vivo* biochemical" studies possible for the first time—a feature that makes this system ideal for studies of gene function. Get highly reproducible gene function data with the Tet-On and Tet-Off Expression Systems. For more information or to place an order, call 800-662-CLON or contact your local distributor.

Notice to Purchaser

Use of tetracycline controllable expression systems is covered under U.S. patent # 5,464,758, assigned to BASF Bioresearch Corp. Prior to purchasing these products, nonacademic research institutions are required to obtain a license from BASF. For licensing information, please contact Amy Porter, Dir. of Business Development at BASF (fax: 508-755-8506).

In Germany please contact CLONTECH GmbH • Tel: 49 6221 303907 Fax: 49 6221 303511

Australia: INTEGRATED SCIENCES • 61 2 9417 7866 ■ Austria and Eastern Europe: BIO-TRADE • 43 1 889 1819 ■ Belgium/Luxembourg: WESTBURG B.V. • 0 800 1 9815 ■ Canada: BIO/CAN SCIENTIFIC • 905 828 2455 ■ Czech Republic: SPINCHEM • 42 19 65214 ■ France: OZYME • 33134 602424 ■ Germany: CLONTECH GmbH • 49 6221 303907 ■ Greece: BIOSURE • 30 1 483 1190 ■ Hong Kong: BIO-GENE TECHNOLOGY LTD. • 852 2646 6101 ■ Israel: BIOLOGICAL INDUSTRIES CO. • 972 4 9960595 ■ Italy: GENZYME SRL • 39 2 6127621 ■ Japan: TOYOBO CO. LTD. • 81 6 348 3786 ■ Korea: KORAM BIOTECH CORP. • 82 2 556 0311 ■ Malaysia: BRISK RESOURCES • 603 777 2608 ■ Mexico: APCO, INC. • 525 519 3463 ■ The Netherlands: WESTBURG B.V. • 31 33 495 00 94 ■ Scandinavia: INTERMEDICA • 46 8 749 5940 ■ Singapore: RESEARCH INSTRUMENTS Pte LTD. • 65 775 7284 ■ Spain/Portugal: GENCIBIO • 34 1 630 0379 ■ Switzerland: P.H. STEHELIN & CIE A.G. • 41 61 272 3924 ■ Taiwan: UNIMED HEALTHCARE, INC. • 886 2 7202215 ■ Thailand: DELTA LABORATORY CO., LTD. • 662 530 3805 ■ Turkey: ERMANAK MISKCIYAN • 90 216 385 8321 ■ United Kingdom: CAMBRIDGE BIOSCIENCE • 44 1223 31 8855

DON'T EXPERIMENT WITH ANYTHING ELSE.

CLONTECH

1020 East Meadow Circle, Palo Alto, California 94303 USA

FAX: 800-424-1350 415-424-1064 • TEL: 800-662-CLON 415-424-8222

E-mail: tech@clontech.com orders@clontech.com • Internet: <http://www.clontech.com>

©1996, CLONTECH Laboratories, Inc.

(AD67490)

Circle No. 48 on Readers' Service Card



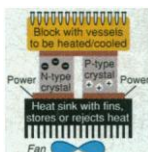
The Peltier-effect Thermal Cycler That Began A Technological Trend: The MJ RESEARCH PTC-100



Left to right: A PTC-100-96AgV with a speedy silver-gold block that can ramp at up to 2.5°C/sec, a PTC-100HB with improved Hot Bonnet heated lid that applies heat and pressure to the tops of tubes or plates for oil-free reactions, and a PTC-100-16MS that holds 16 slides & 24x0.2ml tubes for *in situ*.

How Peltier-effect Heat Pumps Actually Work

The Peltier effect is a solid-state physical phenomenon that was first described by Jean Peltier in the *Annales de chimie* in 1834. Peltier observed



that when current passes through a bimetallic junction, one side gets hot and the other gets cold. In the 20th century, this "effect" has been combined with semiconductor technology to construct small, bi-directional heat pumps that are electronic in nature. These pumps are extremely precise and reliable, and they are the basis of MJ cyclers.

RIGHT WAY TO USE PELTIER

It is now widely accepted that Peltier heat pumps are the best technology for thermal cyclers—but exactly how these pumps are applied is critical. A design was pioneered with the PTC-100 where the pumps are mounted between a low-mass sample block and a large, efficient heat sink. Permanent mounting allows fast, efficient heat flow between the pumps and the block. The heat sink can store heat to be later pumped back into the sample block, or it can disperse the heat to outside air—this depends upon the action of a computer-controlled fan.

The Cycler That Went To War in the Persian Gulf and Battled Plague in India

When adversity flared in the Persian Gulf six years ago, the tools of molecular biology were brought to the front. Biological weapons were threatening; means to detect their use were needed. PTC-100s were there—and they did their duty.

In 1994, unsettling reports were circulating that plague had erupted in Surat, India. Indian authorities were addressing the problem as best they could, but the skills to detect *Y. pestis* had atrophied over time. Working with the WHO, MJ RESEARCH donated several PTC-100s, allowing Indian scientists to use molecular methods to battle the disease. In the final analysis, *only* these molecular tests* proved that the plague pathogen was ever present (see *Nature Med* 1:1237-9).

* PCR is covered by patents owned by Hoffmann-La Roche, Inc. & F. Hoffmann-La Roche Ltd. Users should obtain license to perform the reaction.



MJ Engineer Paul Titcomb in 1990, with a PTC-100 that was camouflaged by the U.S. Marine Corps for field use in *Operation Desert Storm*. Circle No. 38 on Readers' Service Card

A MUCH-COPIED DESIGN

First Introduced in 1988 and Improved Over Time—It Still Outperforms Most Cyclers

WATERTOWN, Mass. — In 1986 and 1987, much "buzz" was circulating in the biology community about a new method for identifying and amplifying sequences of DNA that was being developed by the Cetus Corporation. A tantalizing paper describing an early form of PCR* had appeared in *Science* in late '85, but a critical refinement—the use of thermostable polymerase enzyme—was not described officially until '88. At that time, the need for significant numbers of instruments to thermally cycle tiny aliquots of biological reagent first became apparent.

The partner of the Cetus Corporation, The Perkin-Elmer Corporation, concentrated on the development of a thermal cycler based upon mechanical vapor compression technology. MJ RESEARCH, INC.—then a year-old start-up company—recognized the opportunity and began development of instrument based upon the more promising Peltier-effect heat pump. Several other companies in the U.S. and England also began development of thermal cyclers—mostly based upon resistive heating and passive air or water cooling (though one other US firm also developed a variant of the Peltier cycler).

In late '88, MJ RESEARCH introduced the world's first Peltier thermal cycler—the PTC-100. Since that time, the instrument's design has been modified, crafted, tweaked—and perfected. To this day, the PTC-100 outperforms most competing cyclers in uniformity, speed, accuracy, and capacity—even though at least twenty other manufacturers have since entered the market. MJ has introduced newer designs—the Mini-Cycler, DNA Engine, and Tetrad—yet the PTC-100 remains a respected workhorse of science.

But perhaps the greatest compliment to this pioneering design is the ubiquitous imitation. Though it was scorned at first by some, the PTC-100's configuration is now mimicked by virtually every manufacturer in every new introduction.

E-MAIL: SALES@MJR.COM • WEB: HTTP://WWW.MJR.COM



MJ RESEARCH, INC.

Manufacturer of Peltier-effect Thermal Cyclers

149 Grove St. • Watertown, MA 02172 USA
(800) 729-2165 • Fax (617) 923-8080
Distributors Worldwide—Fax, E-mail or Web for List

Do It Yourself Library Screening

Get 85-100 kb or 120+ kb P1 or PAC/BAC clones by performing your own library screening with "Down-to-the-Well"™ PCR'able DNA pools or by using High Density Colony Filters from Genome Systems, Inc.

PAC/BAC PCRable DNA Pools

Genome Systems provides its PAC/BAC libraries in convenient DNA pools for screening by PCR¹. Depending upon your choice of kits, enough DNA is provided for 25 or 50 screens.

Our High Density Filters Can Be Hybridized with Your Choice of Probes

Genome Systems double-spots up to 150,000 colonies on 22 by 22 cm filters, (36,864 spots per filter). Double-spotting makes it easy to identify true positive colonies over the background noise generated by hybridization probes.

In addition, the clone address can be easily determined by the position of the two hybridization signals created by double spotting.

From a single copy gene, a multi-gene family, or an entire YAC clone, you can identify the cognate clones. Or let Genome Systems convert even the largest YAC into overlapping sets of P1 or PAC/BAC™ clones in a matter of days.

Our services include;

- P1 (85kb) genomic library screening service (human, ES mouse for knockouts, rat and drosophila).
- Human PAC; or Human, Mouse ES 129/SvJ, Mouse C57BL/6, Mosquito or Zebrafish BAC (120kb+ insert) genomic library screening services.
- IMAGE human, and mouse cDNA clones.
- Custom gene knockout services.
- Matched 129/SvJ mouse BAC library and 129/SvJ ES cells.

Other P1 or PAC/BAC™ services include:

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

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

GenomeSystemsInc™

8620 Pennell Drive

St. Louis, Missouri 63114, USA

(800) 430-0030 or, (314) 692-0033

Facsimile: (314) 692-0044

France: Appel gratuit, 0590-2104

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

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

email address: Genome@MO.net

World Wide Web: <http://www.genomesystems.com>

Circle No. 11 on Readers' Service Card



Oligos Custom-Built to Your Blueprints



Whether you need a refrigerator full of primers and probes, or an exotic, one-of-a-kind modified oligo, Genosys is always ready to "build to suit."

Unlike many other suppliers, we actually welcome your special requirements. For example, labeled oligos for non-isotopic detection. Our "assorted flavors" include biotin, fluorescein, alkaline phosphatase, digoxigenin,[†] ABI dyes, and rhodamine. All routine at Genosys.

S-oligos for antisense studies? Large scale synthesis? Custom libraries? Arbitrary 10-mers? Custom genes? Talk to us; you won't be disappointed.

Of course you'll also want the highest quality. So you'll be pleased to learn that Genosys delivers every oligo with its own Quality Assurance Certificate, including digitized PAGE analysis, quantitated yield, melting temperature, MW and $\mu\text{g}/\text{OD}$. As for delivery, standard orders are shipped within 24 hours; can anyone beat that?

If you have particular requirements for research-ready DNA—or if you're just very particular about the DNA used in your research—call, fax or e-mail for our latest catalog. Maybe we can build something together.

Genosys Biotechnologies, Inc.

The Woodlands, TX U.S.A.
Phone: (800) 853-3385
or (281) 363-3693
Fax: (281) 363-2212
eMail: genosys@main.com

Visit our World Wide Web Site
<http://www.genosys.com>



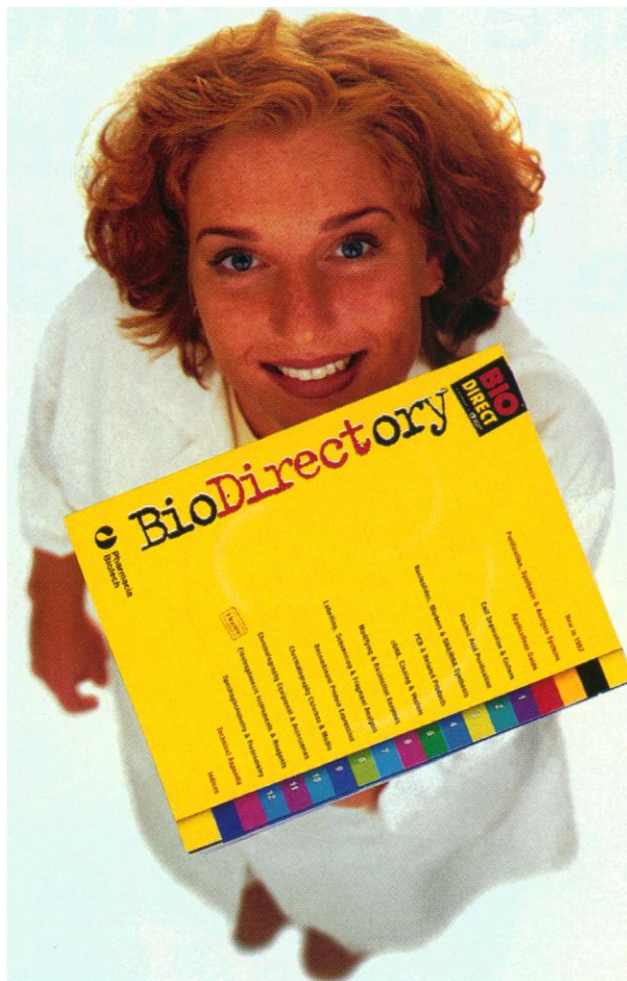
© 1996 Genosys Biotechnologies, Inc.
GBI-96092

[†] Licensed from Boehringer Mannheim GmbH
Pricing for U.S.

GENOSYS

1-800-853-3385

Circle No. 30 on Readers' Service Card



Our latest product — designed by you BioDirectory '97

Years of customer research. That's what's gone into BioDirectory™ '97, Pharmacia Biotech's new product catalog. Years in which we have listened to you and your views on catalogs. The result? A compact, easy-to-use tool for life science research — designed by you.

Convenience starts on BioDirectory's cover with the at-a-glance listing of contents and continues right through to the clear contact information on the back cover.

In between, you'll find all you want to know about our more than 3,000 products in a concise, easy-to-

digest form. The new tabbing system pilots you quickly through BioDirectory. Ordering information is next to the product — as ordered — and we've added a separate technical appendix and applications guide.

In short, it's all you'll need to have at hand — and its distinctive design means that it will always be on hand.

Contact your local Pharmacia Biotech office to get your own BioDirectory.

As we say in Sweden, "tack så mycket" (thanks very much) for your help.

Circle No. 49 on Readers' Service Card

 **Pharmacia
Biotech**
Uppsala, Sweden. (And the rest of the world)

Are you **sure** you're hooking the best leads?

New discovery techniques have today's laboratories teaming with potential lead compounds. But to find the best leads, you must be able to analyze all available information on your project. Without a way to view screening and assay results together with chemical data, you may be wasting your efforts on small fry.

How do you decide which leads are keepers? ISIS™ for Microsoft® Excel outfits the familiar Excel interface with industry-standard capabilities for searching and manipulating biological data and chemical structures. Now you can access corporate data repositories, conduct sophisticated SAR analyses, and create comprehensive reports. All of which makes it easier to land leads with product potential.

ISIS for Excel comes from MDL Information Systems, Inc., the leader in discovery data management for nearly two decades. Talk to MDL today to put ISIS for Excel to work in your lab. Because while you talk about the one that got away, your competition may be reeling it in.

*Call us at 510-357-2222, ext. 4747,
or visit our website at
www.mdli.com/isis_for_excel
While we can't point you toward
hot fishing spots, we can introduce
you to some great information
management solutions.*

MDL is a registered trademark and ISIS is a trademark of MDL Information Systems, Inc. Microsoft is a registered trademark of Microsoft Corporation. All other product names are trademarks or registered trademarks of their respective holders.



MDL

Information Systems, Inc.

14600 Catalina Street
San Leandro, CA 94577
510-895-1313
Fax 510-483-4738
email: isis@mdli.com
http://www.mdli.com/isis_for_excel

Circle No. 14 on Readers' Service Card



We challenge you to find a more powerful UV/VIS for bioresearch.

The Perkin-Elmer Lambda BIO UV/VIS will take on any bioresearch application you have in mind, including analysis of proteins, peptides, nucleic acids and enzyme kinetics. These powerful systems are backed by the same expertise that brought you PCR, automated DNA sequencing and DNA synthesis. And they all deliver the performance and reliability that make Perkin-Elmer the world leader in analytical instrumentation.

Lambda BIO UV/VIS features more than 70 preprogrammed, easy-to-use applications to make

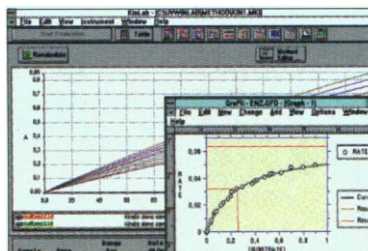
the most challenging assay routine. For even more capabilities, add powerful UV WinLab™ software.

So if you're in the market for a UV/VIS, put the Lambda BIO to the test. When it comes to bioresearch, no other system



comes close. For information, in the U.S. call

1-800-762-4000. Outside the U.S., contact your Perkin-Elmer representative. On the Internet: <http://www.perkin-elmer.com>.



New Lambda BIO 10, 20 and 40 UV/VIS

PERKIN ELMER

Canada Tel: 1-800-561-4646 Fax: 416-674-9520 **Europe** Tel: 49-7551-81-3521 Fax: 49-7551-1616
Japan Tel: 81-45-314-8381 Fax: 81-45-314-5142 **Latin America** Tel: (5511) 578-9600 Fax: (5511) 276-1864
U.S.A. Tel: 1-800-762-4000 Fax: 203-761-2882

WinLab is a trademark of The Perkin-Elmer Corporation.

All analytical instruments and systems manufactured by Perkin-Elmer are developed and produced under the quality requirements of ISO 9001.

Circle No. 32 for Literature
Circle No. 33 for a Sales Call

The Importance of Choice

INTRODUCING 19 NEW HIGH-SENSITIVITY RENAISSANCE® LABELING KITS AND DETECTION SUBSTRATES

Specifically designed for nonradioactive detection of DNA and RNA using chemiluminescence and chromogenic methods, the Renaissance line of easy-to-use kits and substrates brings an unbeatable combination of sensitivity, reliability, and choice to your laboratory.

At NEN, we're committed to serving the life scientist as never before.

That's why we're expanding our already comprehensive Renaissance nonradioactive labeling and detection product offering by introducing 19 new high-sensitivity labeling kits and detection substrates.

1.3×10^6 copies

4.3×10^7 copies

1.4×10^7 copies

4.8×10^6 copies

1.6×10^6 copies

5.4×10^5 copies

1.8×10^5 copies

See for Yourself — Superior Sensitivity in Short Exposure Time

Figure 1

Figure 1. Colonies were screened for the TGF- β 1 gene with a fluorescein-labeled oligonucleotide probe and Enhanced Luminol. This film demonstrates results obtained using the Renaissance 3'-End Labeling Fluorescein Kit with Antifluorescein-HRP (NEL823) and the detection substrate Enhanced Luminol (NEL201). Discs were exposed to Reflection film for 15 minutes.

Figure 2. Mouse β -actin was detected using a fluorescein-labeled ssRNA probe and ready-to-use CDP-Star. This film demonstrates results obtained using Renaissance RNA Fluorescein Labeling Kit with Antifluorescein-AP (NEL633) in conjunction with ready-to-use CDP-Star (NEL601). Blots were exposed to Reflection film for 5 minutes.

Figure 2

Whether your labeling method of choice is Random Priming, Nick Translation, 3'-End Labeling, or RNA Transcription, there is a convenient kit for use with our chemiluminescent or chromogenic substrates. For ultimate flexibility, versions of all kits are available to make hybridization probes labeled with either fluorescein or biotin and include either alkaline phosphatase or horseradish peroxidase conjugates. Once your DNA or RNA probes are labeled, detection is quick and simple on GeneScreen membrane with either ready-to-use CDP-Star™ or Enhanced Luminol and Reflection™ film or 4CN Plus.

These new labeling kits give you everything you need to label probes in preparation for in situ hybridization (ISH) applications of Renaissance Tyramide Signal Amplification (TSA™) — the breakthrough technology that gives you unprecedented signal amplification that is up to 1000 times greater than conventional methods. And TSA can be used with both ISH or immunohistochemistry (IHC) techniques.

With Renaissance products, you get the the largest selection anywhere of nucleic acid labeling and detection products, allowing you the widest range of choice from a single source. And you get the assurance of knowing that product compatibility and system optimization are built in.

Call today to learn more about how Renaissance products provide the quality and choice you need for your lab. And when you do, ask about our expanding line of nonradioactive nucleotide analogs available in a wide range of fluorescein- and biotin-labeled deoxynucleotides, ribonucleotides, and dideoxynucleotides.

Renaissance is a registered trademark and NEN and Reflection are trademarks of NEN™ Life Science Products, E.I. du Pont de Nemours and Company. CDP-Star is a trademark of Tropic Inc., Bedford, Mass. Renaissance products are manufactured under an ISO 9002 Quality System registered by UL. © NEN™ Life Science Products, 1996.



Figure 3

Figure 3. The v-Fos gene was detected in 125 ng of blotted mouse genomic DNA in less than 5 minutes using CDP-Star. This film demonstrates results obtained using the Renaissance Random Primer Biotin Labeling Kit with Streptavidin-AP (NEL604) in conjunction with ready-to-use CDP-Star (NEL601). Blots were exposed to Reflection film for 5 minutes.

NEN™ Life Science Products

Boston, MA 02118-2512 USA
1-800-551-2121 • 617-482-9595
Fax: 617-482-1380
Web: <http://www.nenlifesci.com>
Email: NEN_TECH@WMVX.DNET.DUPONT.COM

Australia (61) 2-923-7355 • Belgium (02) 7242716
France (01) 69825474 • Germany (06172) 872600
Italy (02) 25302-481/319 • Japan (81) 3-5421-1354
Netherlands (078) 6301092 • Switzerland (01) 8410330 • United Kingdom (01438) 73-40-27

Circle No. 52 on Readers' Service Card



Genomics's Wheelers and Dealers

Affymetrix

Santa Clara, California

Key feature: Designing DNA probe arrays using GeneChip system

Key technologies: Semiconductor fabrication techniques that put DNA sequences on glass "chips"

"Our chips allow people much easier access to genetic information. There's a lot we can do by looking at patterns."

Stephen Fodor, President >



Key corporate collaborators	Focus	Deal value
Hoffmann-La Roche	<i>H. influenzae</i> and <i>S. pneumoniae</i> genes	undisclosed
Merck & Co.	human gene expression	undisclosed
Glaxo Wellcome	detection of mutations	undisclosed
IPO date	Value	Share price
6 June 1996	\$90 million	\$15

Key players	Stock holdings (number of shares)	Salaries and other compensation
Stephen Fodor, President	153,333	\$188,819 base salary
Alejandro Zaffaroni	140,000	none reported
Paul Berg	38,488	none reported



Genset

Paris

Key feature: Identifying genes and regulatory regions of genes

Key technologies: Large-scale, high-throughput sequencing; technique for isolating "5 prime" sequences at beginning of genes (including regulatory regions); "functional polymorphism scanning" for analyzing gene variations in a population; bioinformatics

"We discover pathways with minimal benchmark."

Daniel Cohen, Chief Genomics Officer >



Key corporate collaborators	Focus	Deal value
Synthelabo	prostate cancer	\$70.5 million
Johnson & Johnson	schizophrenia	under negotiation
IPO date	Value	Share price
5 June 1996	\$86.4 million	\$16

Key players	Stock holdings (number of shares)	Salaries and other compensation
Pascal Brandy, CEO	Because Genset is a foreign-based company, the U.S. Securities and Exchange Commission does not require the reporting of individual officers' stock and compensation information. The prospectus does, however, report that as a group, these three officers have options on an aggregate of 534,200 shares of stock. They also split \$357,000 in compensation with seven directors (who only received "limited" amounts and "incidental" expenses).	
Marc Vasseur, Chief Biology Officer		
Daniel Cohen, Chief Genomics Officer		

Genome Therapeutics Corp.

Waltham, Massachusetts

Key feature: Sequences pathogen genomes

Key technologies: Proprietary high-throughput "multiplex" DNA sequencing; positional cloning; bioinformatics

"In bacteria, the gap between gene discovery and drug discovery is so much shorter than in humans."
Bernd Seizinger, Chief Scientific Officer >



Key corporate collaborators	Focus	Deal value
Astra AB	access <i>H. pylori</i> gene database	\$11 million
Schering-Plough	access unspecified pathogen database	\$13.3 million
Schering-Plough	asthma	\$22.5 million
IPO date	Value	Share price
1982	not available	not available
Subsequent offering date	Value	Share price
15 February 1996	\$39 million	\$7.69

Key players	Stock holdings* (number of shares)	Salaries and other compensation*
Robert Hennessey, CEO	1,600,000	\$260,000 base salary, \$50,000 bonus
Bernd Seizinger	not available	not available
Philip Leder, Director	137,250	none reported

* From 16 January 1996 proxy statement



Human Genome Sciences

Rockville, Maryland

Key feature: Sells subscriptions to the Human Gene Anatomy Project, putatively the world's largest collection of cDNAs from normal and abnormal human tissues

Key technologies: Large-scale sequencing; bioinformatics

"Our database is a tool of invaluable power for asking medical questions."
William Haseltine, CEO >



Key corporate collaborators	Focus	Deal value
SmithKline Beecham	access to cDNA database	\$125 million
Merck KGaA	access to cDNA database	\$50 million
Schering-Plough	access to cDNA database	\$55 million
Synthelabo	access to cDNA database	\$35 million

IPO date	Value	Share price
1 December 1993	\$27 million	\$12

Key players	Stock holdings (number of shares)	Salaries and other compensation
William Haseltine, CEO	1,162,887	\$200,000 base salary, \$50,000 min. annual bonus, \$9000/year car allowance, \$70,000 legal and accounting fees
J. Craig Venter, TIGR	1,376,513	none reported

Incyte Pharmaceuticals

Palo Alto, California

Key feature: Sells subscriptions to Internet-accessible LIFESEQ database of cDNA sequences and expression patterns

Key technologies: Large-scale sequencing; expression analysis; bioinformatics

"In biotech before, people were staking out claims and trying to mine. [Now we're] making a business out of selling tools to miners."

Roy Whitfield, CEO >



Key corporate collaborators	Focus	Deal value
Pfizer	access to cDNA database	\$15.75 million
Upjohn	access to cDNA database	\$10 million
8 other customers		undisclosed

IPO date	Value	Share price
4 November 1993	\$15 million	\$7.50

Subsequent offering date	Value	Share price
8 November 1995	\$32.3 million	\$19

Key players	Stock holdings* (number of shares)	Salaries and other compensation*
Roy Whitfield, CEO	435,320	none reported
Randall Scott, Chief Scientific Officer	228,345	none reported

*From subsequent offering

Millennium Pharmaceuticals

Cambridge, Massachusetts

Key feature: Identifying disease genes with synergistic approaches

Key technologies: Large-scale DNA sequencing; rapid analysis of differential gene expression; positional cloning; high-throughput expression cloning; bioassays for high-throughput drug screens; bioinformatics; comparative genetics

"Genomics is a whole set of technologies, and it's going to dramatically change the pharmaceutical industry."

Mark Levin, CEO >



Key corporate collaborators	Focus	Deal value
Hoffmann-La Roche	obesity and type II diabetes	\$44.5 million
Eli Lilly	atherosclerosis and cancer	\$61 million
Astra AB	inflammatory respiratory disease	\$53.3 million
American Home Products	CNS diseases	\$90 million

IPO date	Value	Share price
6 May 1996	\$54 million	\$12

Key players	Stock holdings (number of shares)	Salaries and other compensation
Mark Levin, CEO	1,563,216	100,000 share option, \$300,000 base salary, relocation expenses up to \$100,000
Eric Lander, consultant	749,591	maximum \$95,000/yr. fees

Unless otherwise noted, all stock and compensation information comes from company prospectuses filed for initial public offerings (IPOs), and the value of all collaborative deals listed is the total potential revenue, excluding milestone and

Myriad Genetics

Salt Lake City

Key feature: Developing predisposition tests using more than 25,000 clinical samples from large, multigenerational Utah families

Key technologies: High-speed gene sequencing; positional cloning; bioinformatics

"There's a significant opportunity in genetics predisposition testing rather than in developing therapeutics on our own, which is a much riskier proposition."

Peter Meldrum, CEO >



Key corporate collaborators	Focus	Deal value
Ciba-Geigy	cardiovascular disease	\$25 million
Bayer	obesity, osteoporosis, and asthma	\$25 million
Eli Lilly	breast cancer	undisclosed

IPO date	Value	Share price
5 October 1995	\$46.8 million	\$18

Key players	Stock holdings (number of shares)	Salaries and other compensation
Peter Meldrum, CEO	609,657	\$175,355 base salary, \$90,000 bonus
Mark Skolnick, VP of R&D	657,694	\$90,182 base salary, \$100,000 bonus
Walter Gilbert, Vice Chair	304,454	\$10,000 annual retainer

Sequana Therapeutics

La Jolla, California

Key feature: Has access to more than 30,000 DNA samples from individuals and families affected by specific diseases

Key technologies: Positional cloning; high-throughput DNA sequencers and analyzers; high-throughput cell-based drug screens; bioinformatics; comparative genetics

"All biotechnology companies, by dint of the power of genomics, will have to tailor their research programs toward genomics."

Kevin Kinsella, CEO >



Key corporate collaborators	Focus	Deal value
Boehringer Ingelheim	asthma	\$32.5 million
Glaxo Wellcome	type II diabetes	undisclosed
Corange	osteoporosis	\$21 million

IPO date	Value	Share price
31 July 1995	\$18 million	\$9

Subsequent offering date	Value	Share price
6 March 1996	\$30.4 million	\$19

Key players	Stock holdings (number of shares)	Salaries and other compensation
Kevin Kinsella, CEO*	208,333	\$250,000 base salary
Timothy Harris, Chief Technical Officer	33,333	\$176,500 base salary, \$62,582 moving expenses

* Kinsella also is managing general partner of Avalon Ventures, which has 198,305 shares of Sequana stock.

royalty payments if products are developed. Note that the quoted stock prices likely have changed significantly as the market fluctuates daily, and that stock holdings may include options that have yet to become vested.

Focus on

Drug Metab Research

olism

BACULOSOMES™
RECO™ Reconstituted System
Purified P450's

with Drug Metabolizing Enzymes from PanVera.

BACULOSOMES™

PanVera's BACULOSOMES are simple to use and require no additional protein components for biotransformation activity. These membranes are produced from insect cells co-infected with a baculovirus vector expressing both a recombinant human P450 isoform and rabbit NADPH-P450 oxidoreductase. BACULOSOMES exhibit higher specific activity than human liver microsomes and are competitively priced. BACULOSOMES currently available: 2C19, 2D6, 3A4, 3A4+b₅.

Purified P450's

PanVera's soluble, purified, recombinant human P450's are produced in *E. coli* and yield the highest specific activity that is commercially available. Isoforms currently available: 1A2, 2E1, 3A4.

RECO™ System

Purified P450's are also available in PanVera's ready-to-use "Mix & Metabolize" RECO System, which includes a complete enzyme mix and separate reaction buffer. This format greatly simplifies the use of purified cytochrome P450 isozymes with their associated proteins, making them as easy to use as microsomes but with the inherent advantage of using purified proteins. RECO Systems currently available: 3A4, 1A2.

Other enzymes

PanVera also offers other recombinant human enzymes including cytochrome b₅, NADPH-P450 oxidoreductase, UGT 1*1, and GST's. Additional Drug Metabolizing Enzymes are currently under development.

For more information contact PanVera today.

800-791-1400

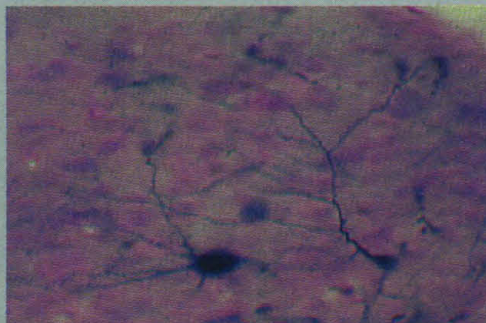
(In the USA and Canada)



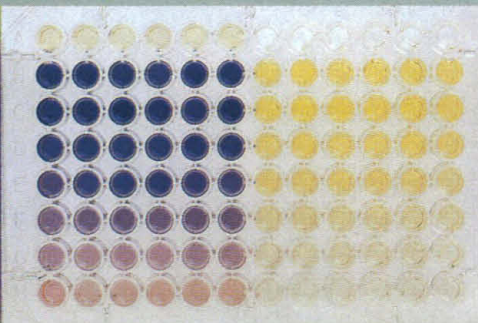
PanVera Corporation, 545 Science Drive, Madison, WI 53711 USA, 608-233-5050 Fax: 608-233-3007, E-mail: info@panvera.com, Homepage: <http://www.panvera.com/> © 1997, PanVera Corporation
In Japan contact TaKaRa Shuzo Co., Ltd, Otsu, Shiga, Japan Phone: +81 775-43-7247 Fax: +81 447-43-9254 In the UK contact Cambridge Bioscience, Cambridge, UK Phone: +44 1223-316855 Fax: +44 1223-360732 E-mail: cbio@cix.compulink.co.uk
In Switzerland contact JURO Supply AG, Lucerne, Switzerland Phone: +41(041)410-1651 Fax: +41(041)410-4564 E-mail: juro_lucerne@mail.tic.ch

Circle No. 47 on Readers' Service Card

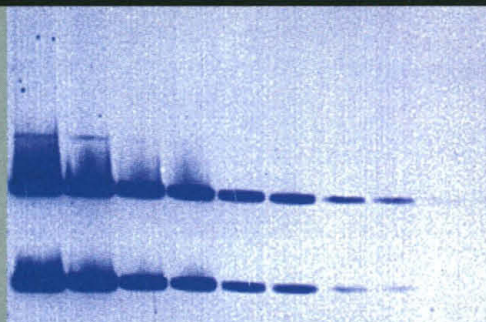
Biotinylated dextran injected iontophoretically into the auditory cortex of rat brain to label somata and neuronal profiles. Tissue treated with KPL's Streptavidin-Peroxidase, followed with TrueBlue[®] Peroxidase Substrate. Counterstained with Contrast RED. Photographed using a 3-dimensional light microscope.



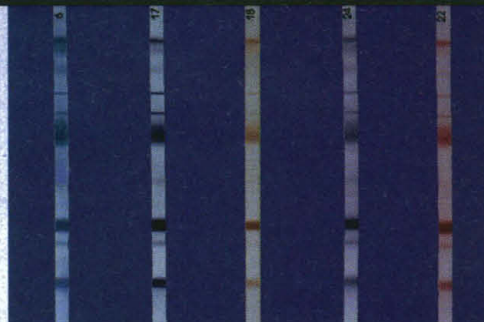
Microplate wells coated with 1.5 µg/ml of rabbit IgG excepting row A, then blocked. Alkaline phosphatase-labeled goat anti-rabbit IgG (H+L) added to row A at a concentration of 50 ng/ml, with a dilution series of conjugate ending in row H at a concentration of 2.5 ng/ml. Incubated for 20 minutes with KPL's BluePhos[®] Substrate (left side) and pNPP Phosphatase Substrate (right side).



Why use radioactivity when you can get results like this without it?



Southern Blot of *EcoR* 1 digested pE1.4 detected using KPL's Biotin Detection Kit. Lane 1: 10 ng pE1.4 Lanes 2-6: 5 ng, 1 ng, 500 pg, 100 pg, 50 pg. Lanes 7-11: 10 pg, 5 pg, 1 pg, 0.5 pg, 0.1 pg.



Western Blots of HIV-1 viral lysate electroblotted onto nitrocellulose membrane. Immunodetection with HIV-positive human serum followed by enzyme-labeled antibody. Immunodetected with appropriate KPL substrate.

Detect, measure and characterize with KPL's high-performance, non-radioactive kits and reagents.

You don't need another lecture on the usage and disposal problems associated with radioactivity. But you do need to know about viable, reliable alternatives. KPL offers over 600 products for applications in ELISA; Western, Southern and Northern blotting; and immunohistochemistry.

- Nucleic Acid Labeling and Detection Systems
- Substrates for Microwell ELISA, Immunoblotting and Immunohistochemistry
- Western Blot Systems
- HistoMark[®] Biotin Streptavidin Kits
- Secondary Antibodies to Human and Animal Immunoglobulins
- BacTrace[®] Antibodies to Selected Bacteria

Because we make our own products, we can provide customers with immediate access to in-depth expertise via our Technical Service line and FastFacts[™]. And we're happy to discuss custom and bulk orders.

Granted, sometimes you have no choice but to use radioactive methods. However, most times you do. That's when you should count on KPL.

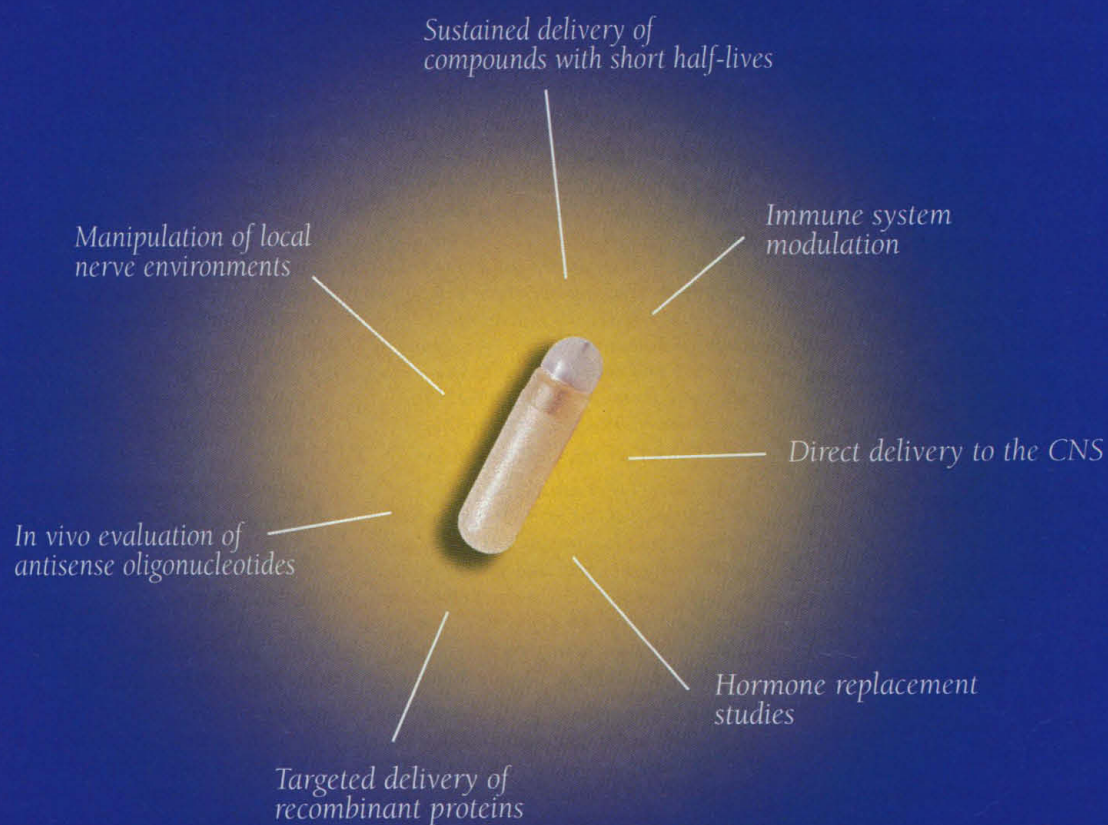
For a catalog and more information, call 1-800-638-3167.



2 Cessna Court, Gaithersburg, MD 20879-4174 U.S.A. • Phone: 800-638-3167 or 301-948-7755 • Fax: 301-948-0169

TrueBlue[®], BluePhos[®], HistoMark[®], BacTrace[®] and FastFacts[™] are trademarks of KPL, Inc.

Circle No. 3 on Readers' Service Card



BRILLIANT DISCOVERIES WITH ALZET PUMPS.

When it comes to new discoveries, ALZET osmotic pumps work to your advantage. By allowing you to deliver drugs continuously, administer agents with short half-lives, and target specific tissues, these miniature implantable pumps make possible experiments that cannot be done using conventional delivery methods. So you can observe effects that might otherwise go unnoticed—and uncover breakthroughs that might otherwise be missed.

Discover the advantage of ALZET osmotic pumps. For references and information pertaining to your area of interest, call ALZET Technical Services at (800) 692-2990. Or visit our web site at www.alza.com/alzet.

alzet[®]
OSMOTIC PUMPS

www.alza.com/alzet

Circle No. 53 on Readers' Service Card

CAMBRIDGE: The Best Titles in Science

Physical Sciences

Comet Hale-Bopp

Find and Enjoy the Great Comet
Robert Burnham

Comet Hale-Bopp is among the great comets of our lifetime. For everyone interested in seeing this new celestial wonder, here's a detailed guide to the coming apparition: how to see the comet, what to look for, how to photograph it – even how to discover a comet on your own. Fully illustrated in color, this book also explains what comets are.

1997 64 pp.
58636-4 Paperback \$12.95

The Sun as a Star

Roger J. Tayler

Following the success of his previous books, *Galaxies* and *The Stars*, Roger Tayler presents the first fully integrated textbook on how studies of the Sun and the solar system help us understand stars in general and other planetary systems.

1996 256 pp.
46837-X Paperback \$24.95

The Quantum Theory of Fields

Volume I: Foundations

Steven Weinberg

"This will become a classic text on a subject of central importance to a wide area of theoretical physics."

—Michael B. Green, CERN Courier

"...for over 20 years there has been no good modern textbook on [quantum field theory]. That he has finally done it...is cause for celebration among those who try to teach and try to learn the subject. Weinberg's book is for serious students of field theory....[I]t is the first textbook to treat quantum field theory the way it is used by physicists today."

—Howard Georgi, Science

"...beautifully produced and meticulously edited...If you want to learn quantum field theory, or have already learned it and want to have a definitive reference at hand, purchase this book."

—O.W. Greenberg, Physics Today

In *The Quantum Theory of Fields*, Nobel Laureate Steven Weinberg presents the classic calculations of quantum electrodynamics in a thoroughly modern way, showing the use of path integrals and dimensional regularization. His account of renormalization theory reflects the changes in our view of quantum field theory since the advent of effective field theories. The book's scope extends beyond quantum electrodynamics to elementary particle physics, and nuclear physics.

1995 635 pp.
55001-7 Hardback \$54.95

The Quantum Theory of Fields

Volume II: Modern Applications

Steven Weinberg

"The insight and depth of his treatment which singles this book out from others in this field can be largely attributed to Weinberg's authority as an originator of many of the ideas in the book...This book combines exposition of technical detail with physical insight in a unique manner that confirms the promise of Volume I and I have no doubt that these two volumes will rapidly constitute the classic treatment of this important subject."

—Michael Green, CERN Courier

"...Weinberg's Modern Applications goes to the boundaries of our present understanding of field theory. It is unmatched by any other book on quantum field theory for its depth, generality and general character; and it will be an essential reference for serious students and researchers in elementary particle physics."

—O.W. Greenberg, Physics Today

Volume II gives a fresh and logical account of the methods of quantum field theory. It includes topics not usually found in books on quantum field theory, such as the Batalin-Vilkovisky formalism and its application to renormalization and anomalies in gauge theories; the background field method; the effective field theory approach to symmetry breaking; critical phenomena; and superconductivity.

1996 510 pp.
55002-5 Hardback \$49.95

The Cambridge Illustrated History of Astronomy

Michael Hoskin, Editor

This is an expertly written and lavishly illustrated account of astronomical theory and practice from antiquity to the present day. Packed with anecdotes and intriguing detail, the book describes how we observed the sky and interpreted what we saw at different periods of history; how this influenced our beliefs and mythology; and how great astronomers contributed to what we now know.

1997 400 pp.
41158-0 Hardback \$39.95

Available in bookstores or from

CAMBRIDGE UNIVERSITY PRESS

40 West 20th St., N.Y., NY 10011-4211
Call toll-free 800-872-7423.

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

Web site: <http://www.cup.org>

MasterCard/VISA accepted.

Prices subject to change.

QCD and Collider Physics

R. K. Ellis, W. J. Stirling, and B. R. Webber

The book provides an introduction to QCD with emphasis on its applications in collider physics. By providing comprehensive coverage of all the important collider processes, the book is both a textbook and a valuable source of reference material for all particle physicists.

Cambridge Monographs on Particle Physics, Nuclear Physics and Cosmology 7

1996 450 pp.
58189-3 Hardback \$49.95

Biological Sciences

Experiments in Ecology

Logical Design and Interpretation using Analysis of Variance

A. J. Underwood

Experiments in ecology require careful planning to produce data that can be used correctly in statistical tests. This book introduces the need for a logical structure to experiments, describes procedures and explains the problems.

1997 522 pp.
55696-1 Paperback \$34.95

Molecular Physiology of Growth

P. T. Loughna and J. M. Pell, Editors

This book is a state-of-the-art review of how messenger molecules such as growth hormone work at the molecular level to regulate growth. The book's strength is its diverse coverage of such processes in different tissues and different stages of development from the foetus to the adult.

Society for Experimental Biology Seminar Series 60

1997 170 pp.
47110-9 Hardback \$54.95

Evolution of Microbial Life

D. McL. Roberts, Paul Sharp, Grace Alderson, and Martin Collins, Editors

This volume considers the evolution and diversification of early unicellular life, drawing together current understanding about the process of evolution itself and suggesting what this knowledge can contribute to the study of biodiversity.

Society for General Microbiology Symposium 54

1996 308 pp.
56432-8 Hardback \$115.00